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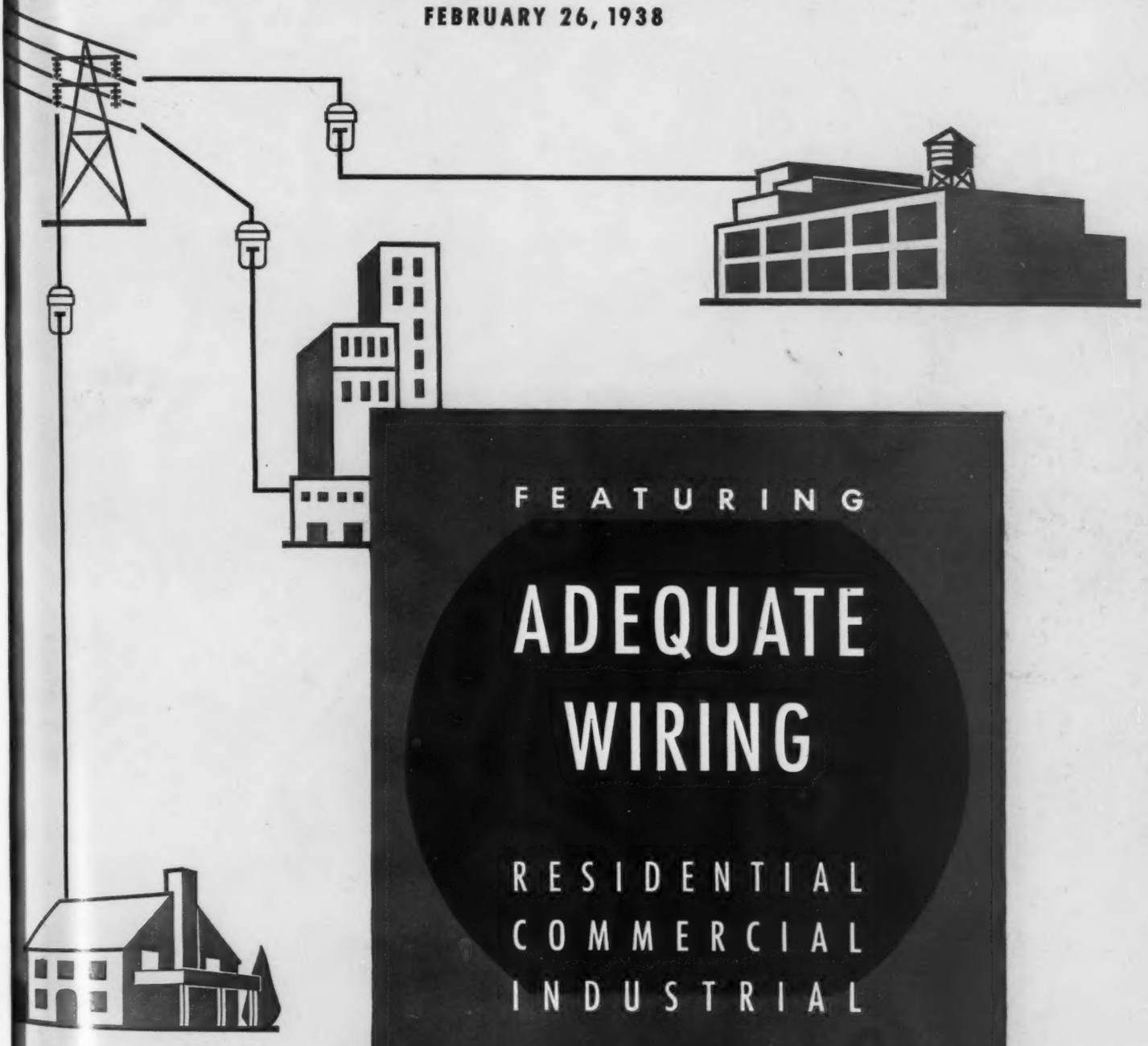

FEATURING

ADEQUATE WIRING

RESIDENTIAL
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Craftsmanship

"A Good Workman is Known by His Tools"

MURRAY CROWNE

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ELECTRICAL WORLD

FEBRUARY 26, 1938

Adequate Wiring Campaign Launched

If we suddenly had to go back to the highways of 1920 at least half the automobiles of the country would be locked up in storage because there wouldn't be enough safe comfortable roads to take care of all of the cars. It is immaterial which came first—the point is that the growth of the automobile industry was not permitted to be retarded by inadequate highways.

The electrical industry has faced this same problem for twenty years or more and now this month is finally getting started on the road to getting results. The National Adequate Wiring Campaign has been launched. Modest to start, it can grow and will grow just as fast as the industry gets behind it.

Like several other successful joint industry programs, this one is directed by a central organization, the National Adequate Wiring Bureau, which develops promotional material, provides field assistance for interested communities, engages in national publicity and encourages the progress of the movement without attempting to dictate in any way the form which any local program will take. The bureau is governed by a board representative of all of the industry interests.

In other words, this is a joint industry program. The manufacturers contribute the money for the national bureau, but without assuming any right to dictate the way the bureau shall be run or to control local operations. Likewise, although most, if not all, of the money for local promotion will have to come from the power companies, they must work their local activity out in co-operation with the other groups and in such a way that all will benefit.

Most of the sales work will have to be done by the utility or league, because, with few exceptions, the house wiring contractor for several reasons, some good, some bad, cannot be expected to do this job. This is a market development program which needs just as much promotion as a range or lighting before there is sufficient public acceptance to create a dealer (contractor) demand.

Under the banner of Red Seal, several cities did engage in selling certified wiring in new dwellings, but while some very commendable results were had, the movement never secured a real foothold nationally. Too many people just knew that wiring could not be sold, and so long as the thought persisted wiring wasn't sold.

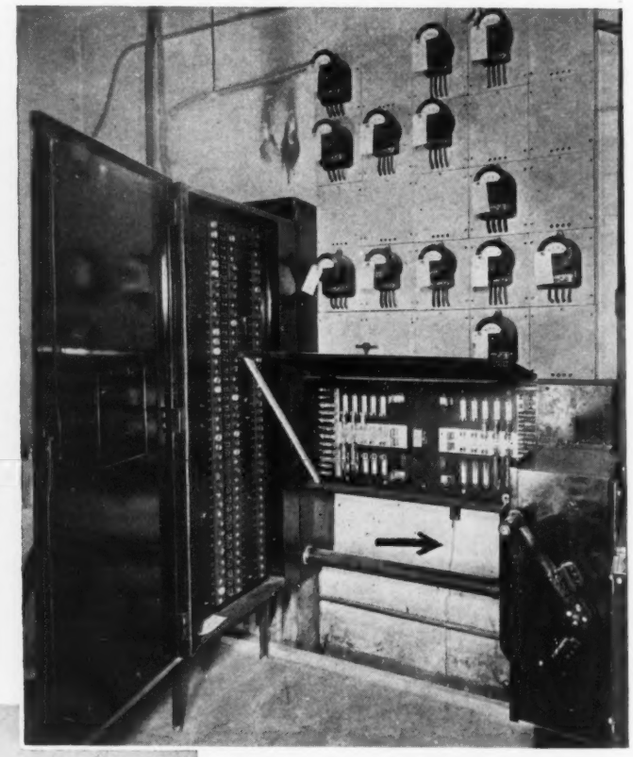
One thing is certain, that if the industry does not sell it, nobody else will. The architect and the builder are interested only in giving people what they want. Until a public demand for adequate wiring arises the building industry is going to spend the customer's money in some other way. This new program, therefore, is predicated upon the fact that wiring can and will be sold.

As a starter the new house wiring program is excellent. It may show how to crack the toughest of all—the old house market. In any event, the current promotional effort will not be wasted when a program is designed for rewiring old houses.

But the advantages of adequate wiring do not rest with the house. The commercial and industrial buildings demand attention. The standards are available; it is the approach to the market and the problems involved that need study. When these have been worked out the electrical industry will be well on its way toward learning the lesson of the automobile industry—good highways, plenty of highways, broad highways, are essential to traffic growth.

Utility Engineers Save

Modernized lighting in Furniture Mart pointed to complete rewiring, but raising the interior feeder voltage to 460 cuts in half the cost of doubled capacity



Main switchboard revised for 460 volts (upper left)

Changing from 230 volts was quite simple, requiring principally to find space for the longer 460-volt fuses. This was done by using special off-set clips which allowed spacing to be enlarged without any changes in the slate panels on the bus work.

Interior of a distribution closet (upper right)

At lower right is the 75-kva, 460/230-volt transformer with primary and secondary switches, convertible meter fuse panel, sectional meter board and a 160-circuit metering type circuit fuse panel. Arrow points to continuous bare ground wire No. 4/0 copper grounding all 230-volt secondaries.

Typical exhibit space (below)

In each fixture a 500-watt lamp replaces one of half the size. Such increases in lighting as this were what made the wiring revision necessary.

One Customer $40,000

By F. E. BUTTERFIELD

Power Sales Division, Commonwealth Edison Company, Chicago

BY RAISING feeder supply voltage from 230 to 460 volts wiring capacity was doubled and the cost of the work was halved in the world's largest furniture display center, the American Furniture Mart building at 666 Lake Shore Drive in Chicago.

This continuous exhibition of home furnishings, home utilities and related goods occupies an entire city block and devotes sixteen floors to display and wholesale merchandising, equivalent to an area of 40 acres. This enterprise is operated like a World's Fair, in the sense that display space is rented with all services to exhibitors. The exhibits, however, are not open to the public, but only to authorized wholesale buyers from all parts of the world.

Needs analyzed

Features of a building to house this enterprise presented many problems. The exhibitor's needs were carefully considered, as were, also, the comfort and convenience of the visiting buyers, yet no similar structure had been built and many important details had to be settled largely by conjecture. Acceptance by the furniture trade has justified the sponsors of the building, and since its completion managements and tenants have progressively advanced the technique of furniture display, aided in no small sense by modern lighting.

Operating conditions peculiar to this business, while resembling somewhat those of wholesale merchandising, are unique in that certain days and seasons are peak periods far out of proportion to the average. In January and July there are major furniture market displays, and secondary market displays in May and November. These markets last two weeks each, but at other times there is much less activity in the Mart, except that on Friday of each week all exhibits are open to buyers.

The use of purchased electric service, from the first, has been of distinct advantage to the owners because of the flexibility of supply and the economy of a variable monthly demand charge, compared to the fixed capacity and fixed carrying charges of a generating plant. This is readily seen from the fact that the maximum demand during the larger show periods is nearly 2,500 kw. and during the rest of the year only 500 kw.

When the building was erected there was little basis for estimating the future lighting intensities. Space requirements indicated that a generous distribution of 200-watt lighting units would be ample for general illumination. This amount of illumination would probably have been concurred in by any good illumination engineer at that time.

The wiring was originally planned with three centers of distribution on each floor, one with a capacity of about 40 kw., the second with about 60 kw. and the third with about 35 kw. These capacities were then somewhat in excess of the connected loads and represented what was then considered good lighting for wholesale display. The supply mains and risers also were adequate for these loads. Wiring was arranged for a 230-volt, two-wire system of risers, so that two distribution centers were supplied from each riser, utilizing a balance coil of about 11 kva. at each riser terminal to establish an ungrounded three-wire system. For these supply risers 400,000-circ.mil cable was used, with four cables to a conduit to conserve space. Service was supplied from a Commonwealth Edison Company transformer vault to a switchboard in the basement.

Load grows and voltage drops

While this system was adequate at the start, more and more load was added as larger lighting units, suitable for the purpose, were developed, progressively 300-watt, 500-watt and larger, as standards of lighting intensity increased, until in January and July of 1936 low voltage in various localities became noticeable. This was due more to the No. 14 wire in the branch circuits than to the feeder capacity, but the visual symptoms indicated that conditions were not altogether as they should be. Tests were taken on the various feeders, and it was found in some instances that the load was 150 per cent or more of the carrying capacity of the cables, and that practically all the cables in the east and center conduit shafts were carrying some overload. The change to higher wattage had yet reached only a portion of the total number of units, and it was clear that relief must be had before further changes could be allowed.

System found inadequate

Contractors and the power company were called in for recommendations. The conditions which were found are not uncommon to wiring systems in buildings ten or more years old, and are, therefore, noteworthy. It was found that the feeder capacity was 50 per cent short of the anticipated future requirements and that the distribution centers required additional fuses for the necessary number of circuits. Meter fuse clips, slate panels, buses, distribution fuse panels and the meter wiring also required attention.

The problem, then, was threefold: First, it was necessary to devise means of increased feeder capacity; second, to provide adequate branch circuit fuse capacity; third, to straighten out the metering situation. All this had to be done without disturbance to the tenants and particularly without inconvenience to visitors. To add conduit and cable to increase the capacity of the riser system would have been difficult construction, a major operation, and would have seriously disturbed both

[*Continued on page 124*]

Competitive Power Presents Sales Opportunities

Analysis of five-year campaign shows revenues reversed upward in highly competitive oil field operations

By A. L. LAWS

Power Sales Engineer, Southern California Edison Company, Ltd.
Los Angeles, Calif.

THERE is an old adage to the effect that your customer is your competitor's prospect. Such being the case, it becomes very important to watch closely our competitor's activity and in instances where it becomes a serious threat to our business to take effective steps to meet the competition. The two steps in meeting such a competitive condition are:

1. To analyze very carefully the conditions surrounding the threatened business; *i.e.*, its importance in so far as annual revenue, load characteristics and return on investment are concerned.

2. To devise a means based on the above analysis to meet the specific competition at hand.

The following outlines a procedure which is being followed by the Southern California Edison Company in meeting a competitive situation in the oil industry by turning it into a sales opportunity.

A. L. Laws

While holding the job of night substation operator for the Southern California Edison Company for three years, Mr. Laws was graduated from California Institute of Technology in 1926. Since then he has taken the company's Engineering Apprenticeship course, has been engaged in utility valuation and commercial sales operations.

Background in brief

Prior to 1932 the electrification of oil fields proceeded at a very rapid rate. Many of the existing fields were being put "on the pump" and these units were, with very few exceptions, motor driven. Steam power was being largely superseded by electrical motors on existing pipe line pumps and new production units were practically 100 per cent electric.

As will be noted on Fig. 1, in 1931 alone 7,200 hp. in gas and steam engines was replaced by electrical drive. During that same year only 25 hp. was lost to engines. During this same year, 1931, kilowatt-hour sales to the oil industry reached an all time peak of more than 301,000,000 kw.-hr. In 1932 the business depression was beginning to make itself felt and kilowatt-hour sales correspondingly dropped. Curtailment of drilling programs, together with the proration of oil output under government direction, was removing one of the main advantages of electrical drive. This advantage, which was so responsible for our success in oil field electrification, was due to the inherently smooth operation of motor-driven well-pumping units which permitted the very maximum oil production. Under proration maximum production was not permitted.

Also, with declining business, gas sales of the oil companies decreased to a point where there was a surplus of fuel gas which could not be sold but which could instead be used as a fuel for other forms of power. The gas engine companies were fully alive to this situation, and as the potential business to them was very large, they began an agressive selling campaign among all of our oil customers. With these three conditions existing and aggravated by the scramble of all companies to retrench and to reduce costs, the gas-operated multiple-cylinder internal combustion engine became somewhat of a threat to our business in the oil fields.

These changed conditions are shown very graphically on Figs. 1 and 2. In Fig. 2 is shown the decrease in oil kilowatt-hour sales to a low of 235,000,000 in 1934. Chart "A" shows the increase in loss of oil business, which reached a peak of 2,718 hp. in 1933.

These facts present an analysis of the competitive situation which faced us in 1933. In searching for the solution, the peculiar power

characteristics of the oil industry also played an important part.

Industry characteristics

In practically all of the southern California oil territory a comparatively few major companies control the fields. They also own and maintain their own high-voltage distribution system and purchase power from us at one location in order to secure as flexible an electric system as possible. Independence of operation and the ability to make quick shifts of equipment with their own field forces is quite an operating asset. The Edison company distribution investment, therefore, in the oil fields is rather small.

Another condition which entered this competitive problem in 1933 was the fact that all classes of load had retrenched to such an extent that our kilowatt-hour sales were accordingly reduced. This reduction amounted, in the case of the Edison company, to 12½ per cent, compared to a national reduction of 14.6 per cent. The Edison company, along with the rest of the central station industry, thus found itself with a surplus of generating capacity and an underloaded transmission system.

Looking toward the future, we could anticipate losing the city of Los Angeles wholesale account in the latter part of 1936. The potential loss of this high load factor oil business thus became a factor worth serious consideration.

The foregoing discussion of the general relation of the oil business to the Edison company may be summarized in three points: First, the oil field business was largely dominated by a few large companies with which we could deal on an individual basis; second, the Edison company's distribution investment was comparatively small; third, the general business decline had resulted in a surplus of both our transmission and generating capacity.

New rate form designed

The oil industry alone of all classes of business thus appeared to be, based on the preceding analysis, the most vulnerable to competitive attack and at the same time to offer an exceptional opportunity to dispose of surplus kilowatt-hours without any increase in power company investment, provided an arrangement satisfactory to the oil companies could be arranged.

After much discussion, a rate schedule known as PDO-1 was brought out in the summer of 1934. This schedule, which was designed for major oil companies, these including those which maintained to a large extent their own distribution facilities, was limited to companies that paid us over our entire system at least $10,000 per year. This schedule was presented to the oil companies and operated on the following basis: It was limited to five years and proposed a 50 per cent reduction in all revenue paid us during the first year of the schedule's life, of all money paid in excess of revenue received during the twelve months preceding the rate acceptance. This twelve-month period was established as a base year and this 50 per cent discount was to continue for five years, with the base year increasing 2½ per cent each year. It was thus possible for an oil company to replace its existing engines with motors on a half cost basis. Also, there was no longer the inducement to use other than electrical equipment for new jobs.

Oil companies accepted

In Fig. 3 is graphically indicated this discount procedure and is the history to date of one of the major companies. Practically all of the major oil companies accepted this schedule. All of the companies agreed with the principle of this discount rate, but later objected to its actual working for the following reason: Practically all of the fields kept a very close record of operating costs, and inasmuch as this discount was on a total company basis, it was impossible for any local production superintendent to show savings on his particular operations as the discount which was returned at the end of the year could not be allocated to individual jobs.

To meet this criticism a second discount schedule, known as PDO-2, was inaugurated in the fall of 1935. This schedule provided that any oil company which qualified for PDO-1 could also have the second schedule for all new business excepting refinery operation, which must continue under the original PDO-1 schedule, on the following basis: The Edison company would discount all individual bills 50 per cent for new business where it was not required to make any additional investment. In case line extensions were necessary, the oil company was required to furnish the extension or to reimburse the Edison company

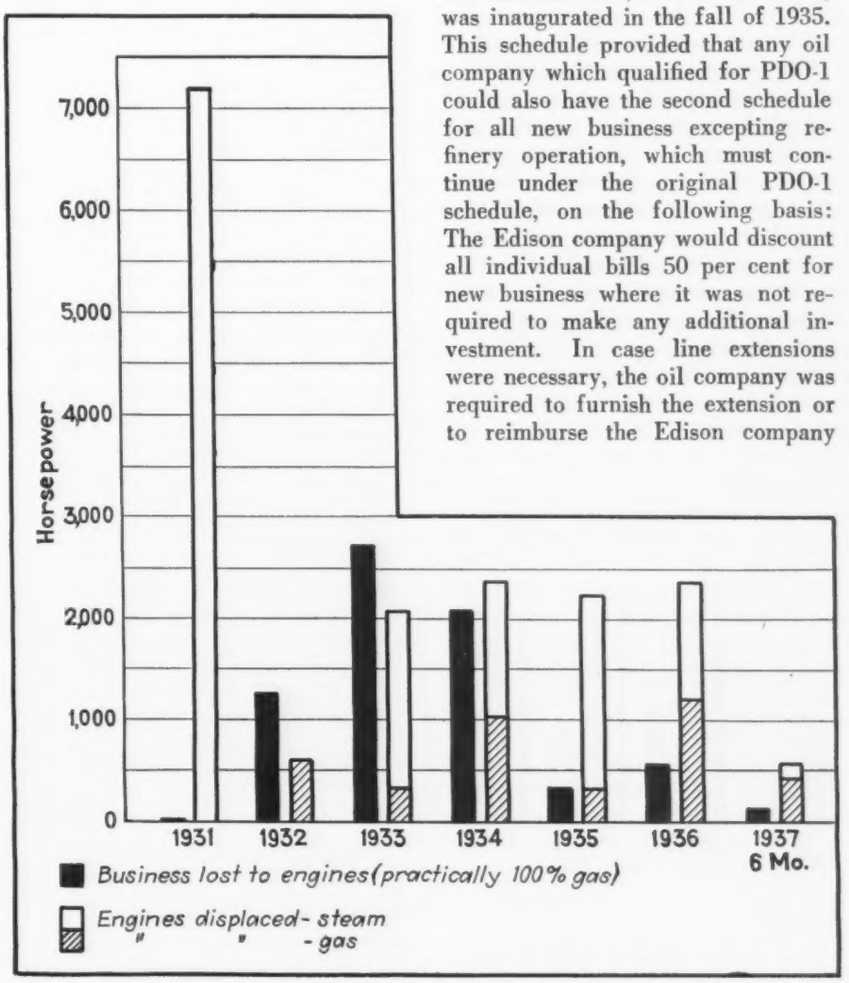


Fig. 1—Rise and fall of loss of business to gas-operated, internal-combustion engines in oil fields served by Southern California Edison
A steady rise is shown in number of gas and steam engines displaced by electric service.

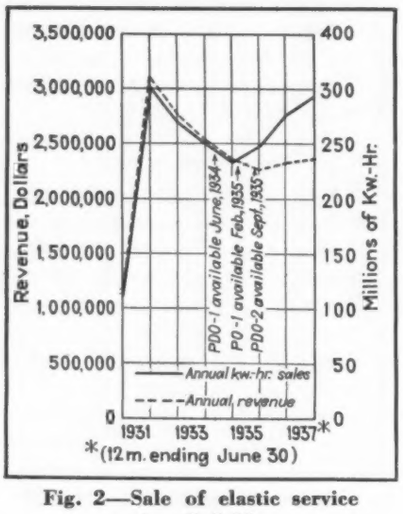


Fig. 2—Sale of elastic service in oil fields

Kilowatt-hour sales have been brought back to previous peak levels and new rate schedules have held up revenue.

for its investment. New business in existing fields, where the major companies owned and maintained their own lines, was handled by submeters and the increment kilowatt-hours were billed at 50 per cent of the average rate, billed on the master meters. Oil companies which have had any business on this PDO-2 schedule are paid disconuts as they accrue. Then at the end of each discount year their bills are recomputed on the basis of PDO-1 schedule, and in event a discount on this schedule amounts to more than they have earned under PDO-2, an additional refund is made equal to the difference.

This second method met oil company objections and for the entire year of 1935 our loses to engines dropped to 332 hp. During 1935 we replaced approximately 300 hp. in gas engines and the following year we replaced 1,200 hp. in gas engines.

Rate for small companies

In the beginning of this article it is mentioned that these two schedules were limited to oil companies which paid us $10,000 per year or over; to meet this engine competition for our smaller oil company accounts, we also brought out a new schedule during the spring of 1935 known as PO-1. This schedule covered all oil field operations and had no restrictions other than a minimum charge, which was $24 per horsepower per year with a yearly minimum of $240. The first 100 kw.-hr. per month per horsepower is at the rate of 2 cents, the balance being at 6½ mills. This schedule resulted in a material decrease in operating costs for high load factor pumping business, which had been particularly vulnerable to gas engine operation.

The result of these three schedules is shown in Fig. 2. The trend in kilowatt sales was sharply reversed in 1935 and the revenue curve followed somewhat behind, due of course to the half rate increment business.

After three years of operation of this six-year schedule the emergency has disappeared (PDO-1 schedule was extended one year with the advent of the five-year PDO-2). Increased sales to other customers have now more than made up for our loss of the wholesale account which we had with the Los Angeles Municipal Bureau of Power and Light. A power surplus will thus not be, in any sense, a factor until Boulder Dam power becomes available to us around 1940. Inasmuch as the above-mentioned rate schedule will also expire in 1940, a very careful study will then be made to determine our future policy with respect to the oil industry.

Aggressive selling vital

It should not be assumed from the preceding discussion that a change in rate schedule is the complete answer to a competitive situation or that such a change should always be made. The peculiar conditions of this specific class of business made the above arrangement desirable and mutually advantageous and at the same time offered an ideal sales opportunity. The fact that these schedules affect only the so-called major companies paying us in excess of $10,000 per year put the arrangement more on the basis of a contract designed to meet

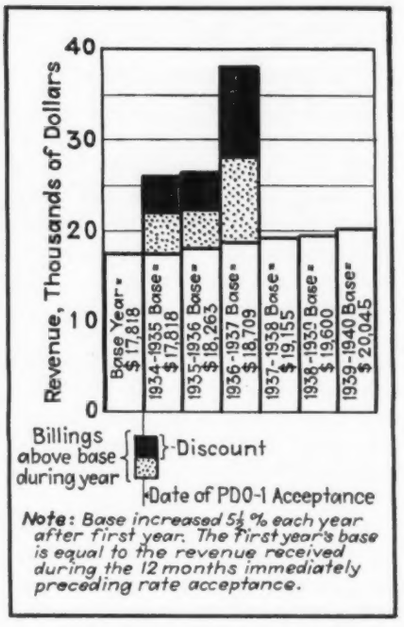

40
30
20
10
0
Revenue, Thousands of Dollars
Base Year = $17,818
1934-1935 Base = $17,818
1935-1936 Base = $18,263
1936-1937 Base = $18,709
1937-1938 Base = $19,155
1938-1939 Base = $19,600
1939-1940 Base = $20,045
Billings above base during year
Discount
Date of PDO-1 Acceptance
Note: Base increased 5½% each year after first year. The first year's base is equal to the revenue received during the 12 months immediately preceding rate acceptance.

Fig. 3—Results of rate schedule for typical oil company customer

This rate schedule was applicable to customers billed $10,000 or more per year.

an extraordinary condition brought about by artificial oil production curtailment coupled with a surplus of free fuel.

To make the operation of these schedules effective it has been necessary to maintain a very aggressive selling campaign. To supplement the original field staff of power salesmen a sales engineer working from the general office was delegated to devote his entire time to oil problems. This work consists mainly in expediting work affecting the oil companies in the Edison company's eleven divisions and is made possible by his close touch with the oil companies' main offices, most of which are located in Los Angeles. The change in rates has not, therefore, been a complete solution to the problem, but has been merely another tool for the use of our power salesmen.

ANNUAL SUPPLEMENT, 100,000,000-KW.-HR. SYSTEMS

SCHEDULED FOR PUBLICATION May 8, the annual supplement to Electrical World will present operating statistics on large electrical systems under 27 heads. The list will comprise about 150 light and power systems in the United States, twenty in Canada, one in Mexico and fourteen electric railways and electrified railroads, making a total of nearly 5,000 separate items. In addition, comparative statistics on output and peak load will be separately tabulated for each system over a series of years.

Shreveport's New Network Trim, Guarded, Growable

TYPICAL as it is of good modern design in high load density distribution, the underground secondary network recently put into operation in Shreveport, La., by the Southwestern Gas & Electric Company has, nevertheless, certain novel features that make it distinctive. Among these are the secondary buses in the transformer vaults, the back-up fuses on customers' services and the special telephone system by which communication may be had between vaults, feeder substation and office.

The peak load in the downtown area of Shreveport increased from 5,300 kva. in 1929 to 8,000 kva. in 1936, when work on the network was begun. An important proportion of this load increase is represented by air conditioning, a fast-growing load in Southern cities, and which has added nearly 2,000 hp. to the downtown summer peak in Shreveport in the past two years. The present network does not serve the entire load, but will be extended in 1938 to do so. The network is a standard four-wire system of 120/208 volts with 11,500 volts primary. There are four primary feeders rated at 5,000 kva, each out of one substation, in two pairs that reach the network by different routes. All transformers are of the same size, 500 kva., seventeen of them in the twelve vaults on the system. All vaults have space for three transformers, so that the capacity of the present network may readily be increased to 18,000 kva. if load growth requires.

Typical vault in customer's building
Note secondary bus and back-up fuses in service connection.

The phase conductors of the secondary mains are 500,000 circ.mil copper and the neutral is 250,000 circ.mil. Capacity increases are obtained by paralleling these conductor sizes. Non-metallic cable is used for secondary mains and for services because of its better heat-dissipating characteristic and for its convenience in handling and in making connections, such as, for instance, by the use of G & W multi-taps as shown in one of the illustrations. Non-metallic cable is also used for services. In each vault is installed an open, flat copper bus to which transformer secondaries and distribution mains are connected and from which may be taken services going out from the vault. All heavy services, like the one shown above, include open copper link fuses that serve as back-up protection behind the entrance fuses on the customer's premises and that are expected to prevent network protector operations from trouble on services or on customer's equipment.

The Southwestern Gas & Electric Company uses leased wires of the public telephone system for communication in normal operation. But

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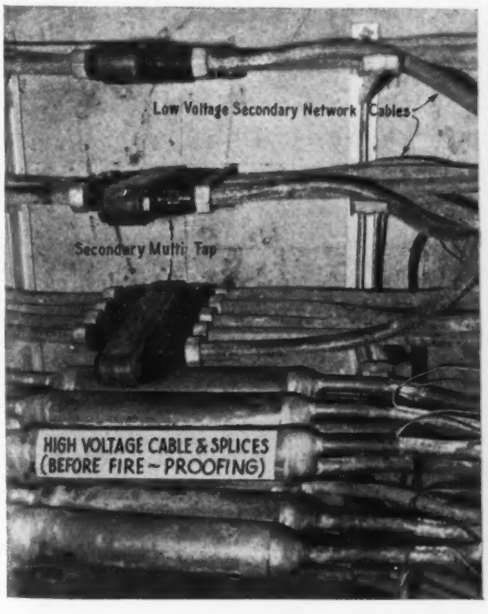
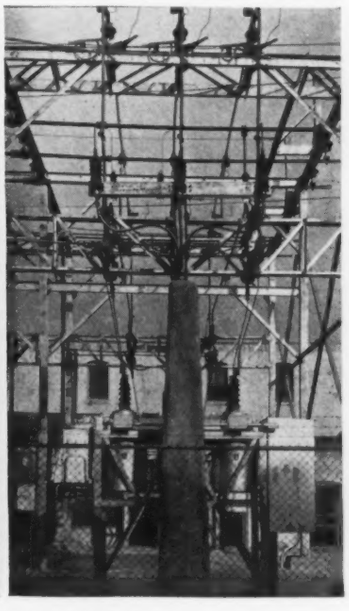




No splices in secondary cables (left)
Down run of 11-kv. feeder at substation (right)

Analyzing Steam Plant Increment Costs

By PAUL B. METCALF*

Steam Engineer New England Power Service Company, Boston.

TO OBTAIN the lowest cost of power under all operating conditions intelligent use of accurate incremental cost data is necessary from hour to hour for the plants involved. Complete attainment of the desired results is usually hampered by obstacles such as service requirements, transmission line limitations, contractual features or possibly legal or governmental restrictions, but the objective may be approximated within local or system limits.

The term "Increment Costs" means the total additional cost of generating an additional amount of power for a given period on a given plant, as distinguished from the total over-all average cost of power. Decrement costs represent savings on decreasing loads. For economical results, hourly increment cost rates should be used so that instantaneous values for any block of power are always known. Misleading and wasteful results would follow the application of average increment costs obtained from variations in daily generation to hourly changes in load, since these daily averages do not represent the true cost of power at any instant.

No hard and fast rules can be set down for all steam plants in considering cost items which are variable in relation to output. However, certain guiding principles are fairly generally accepted. The main factors affecting costs, both fixed and operating, are: A, plant capacity in kilowatts; B, actual peak load prepared for; C number of hours per day peak prepared for; D, plant output in kilowatt-hours. As an illustration of actual cost accounting items varied by each of the above factors, see Table I. This is intended purely as a guide and should not be interpreted as being universally accepted.

"Plant Capacity in Kilowatts" is largely a question of original design and hence is a fixed amount after completion of a plant. It falls outside the scope of this discussion.

"Actual Peak Load Prepared For" determines the size and number of boilers, turbines and auxiliary equipment which shall be kept on the line but not actually generating. Such conditions determine the labor required to operate the equipment on the expected peak. Furthermore, as all necessary equipment is on the line even though functioning at little or no load, maintenance charges are continuously accruing. The actual maintenance work may not be done until a much later date, but is nevertheless properly chargeable to the time it was incurred. Also, the fuel and water consumed to carry the no-load losses of the equipment required for the expected peak are determined by "B."

All of these items, together with smaller miscellany, are increased as the "Peak Prepared For" increases and, once established by the latter, become an hourly function. In other words, changes in cost brought about by "B" may be expressed as a fixed amount per hour as long as the condition exists. In addition there are certain items of expense which occur only once in the preparation for a peak and are expressed as a fixed lighting off boilers and for starting turbines.

In the application of the above data for load allocation purposes it is only the additional expense of preparing for a given additional amount of peak that is chargeable to the latter. For example, if a plant was

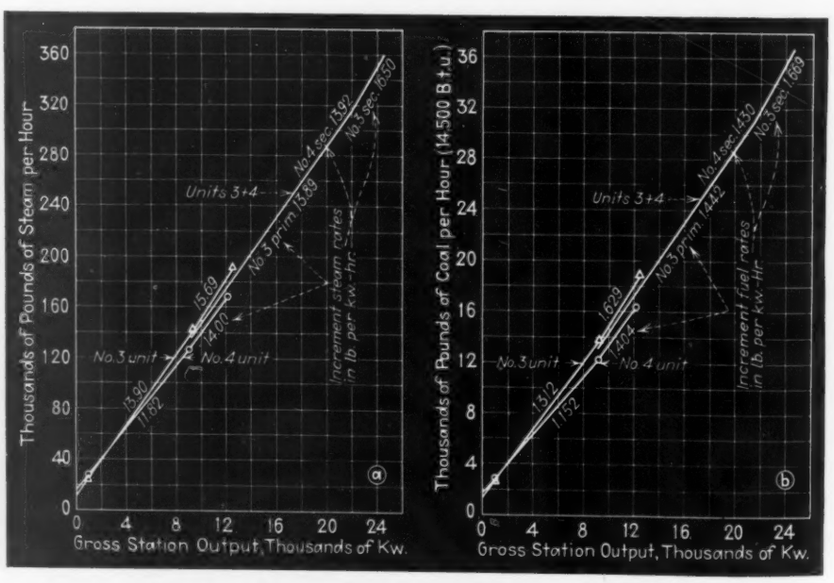


Fig. 1—Calculated station steam vs. gross output

(a) For turbo units 3 and 4 and for the combination; 200 lb. pressure, 125 deg. F. superheat, 28.5-in. vacuum, 208 deg. F. feedwater. Increment steam rates in pounds per kw.-hr. are noted along corresponding sections of each graph. (b) Fuel consumptions and outputs for units of (a).

* From a paper before the New England System Operators Club.

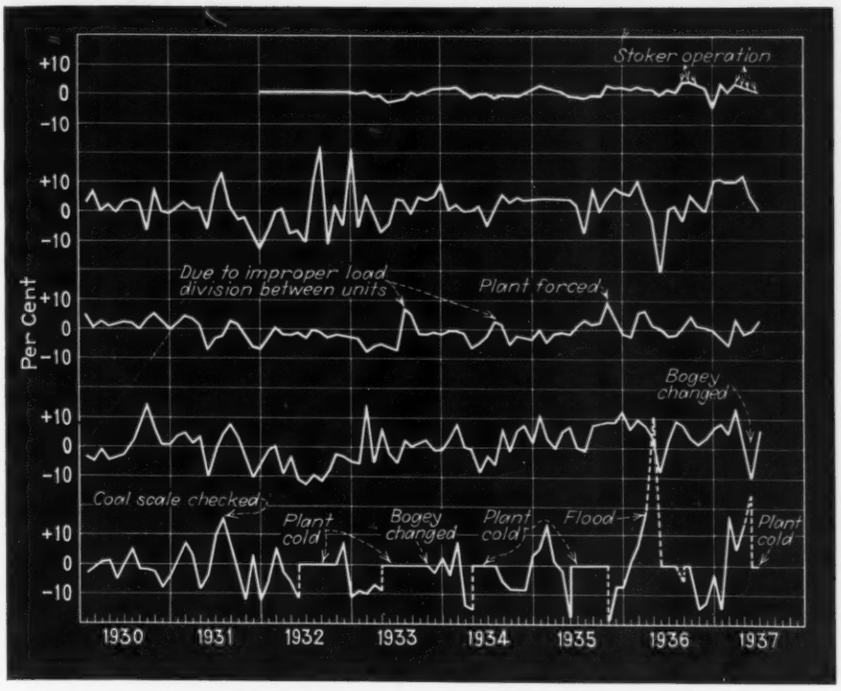


Fig. 2—Comparison of actual fuel burned with calculated bogey fuel for several steam plants

already prepared for a peak of 50,000 kw. and an additional 20,000 kw. was desired, only the additional costs brought about by the 20,000 kw. are chargeable to it.

The "Number of Hours per Day Peak Prepared For," item "C," is merely a function of the length of time that "B" is required. If the result of preparing for "B" is "X" dollars per hour and "C" demanded fourteen hours, the expense chargeable to peak preparation would be "X" dollars times fourteen.

"Plant Output in Kilowatt-hours," or "D," affects fuel cost, water cost and boiler maintenance. These additional costs due to kilowatt-hour output are meant to be over and above the expense determined by "A," "B" and "C."

Determination of fuel cost

The familiar "Willans' line" shows the relationship between total generation and steam consumption on a turbine and between steam production and fuel consumption on a boiler. For a turbine the relation with load as abscissa and steam consumption as ordinate approximates an ascending straight line which intersects the no-load point above zero on the steam consumption scale. This no load intercept represents the steam required per hour to operate the turbine up to speed with zero generation. The straight line beyond the no-load point gives the added or incremental steam to generate load as a constant number of pounds or steam per kilowatt-hour.

In a turbine with primary and secondary admission valves the slope of the "Willans' line" increases at the point where the secondary valve opens, giving a second incremental steam rate.

A boiler "Willans' line" resembles the turbine line, but has an increasing upward curvature as the higher ratings are approached. The no-load fuel intercept for a boiler is the "live bank" or amount of fuel necessary to keep the boiler up to pressure without any production of steam. The line beyond the no-load point represents the additional fuel required for the production of steam and may be expressed as a constant (within certain ranges of rating) incremental evaporation rate.

Both boiler and turbine intercepts represent the charges incurred in preparing for a given peak load as classified under "B," while increments are applicable against actual generation, classified under "D."

Willans' lines for station steam consumption against generation and total fuel consumption against station generation have the same characteristics as the simpler single boiler and turbine lines.

Typical curves of station steam and fuel against station generation are shown in Fig. 1. The steps in the line show where additional turbines are added for the required load.

Once the station steam line vs. generation is established, it is a relatively simple step to obtain from boiler Willans' lines the fuel required to produce the necessary steam for any given station load. Then by taking differences in kw. and pounds of fuel corresponding to the kw., and dividing the difference in fuel by the difference in kw. may be obtained a slope or increment fuel rate per kilowatt-hour for any load range.

Then, applying the cost of fuel at the boiler to the increment pounds of fuel per kilowatt-hour gives a rate in mills per kilowatt-hour for the generating period.

It very often occurs in actual practice that boilers required for a certain kw. load are used for generation for, say, only fourteen hours of the day and are banked for the remaining ten hours, in which case the fuel consumed during the banking period is properly chargeable to the kilowatt-hours generated during the fourteen hours. This charge is arrived at by multiplying the hourly boiler intercept fuel by ten hours and dividing by the kilowatt-hours generated in the fourteen-hour period. The result is in pounds of fuel per kilowatt-hour, which may readily be converted into mills per kilowatt-hour for the banking charge.

In a case like this, where boilers are being held in a banked condition and the fuel consumed in this banking period has already been charged to some previous kilowatt-hour generation, it is obvious that the additional cost of generating from this banked condition should not include the boiler intercept fuel, but only increment boiler fuel.

A similar case is where boilers are being held in a banked condition for local service protection to guard against transmission line failure. Here again the cost of possible generation from this condition should not include the boiler intercept cost, because the latter would have existed whether or not any generation took place. In other words, it would be hardly logical to charge the same fuel costs twice.

The same line of reasoning ap-

Table I—Items Affected by Various Factors

Production Expense	A Plant Capacity in Kw.	B Actual Peak Load Provided For	C Hrs. p. Day Peak Prepared For	D Plant Output in Kw.-Hr.
Operation				
Superintendence	Yes	No	No	No
Labor—Boiler room	Yes	Yes	Yes	No
Labor—Engine room	Yes	Yes	Yes	No
Labor—Electrical	Yes	No	No	No
Labor—Miscellaneous	Yes	Yes	Yes	No
Fuel	....	Yes	Yes	Yes
Water for steam	....	Yes	Yes	Yes
Lubricants and waste	....	Yes	Yes	No
Station supplies and expense	....	Yes	Yes	No
Total operation				
Maintenance				
Boiler plant equipment	Yes	Yes	Yes	Yes
Turbo generator equipment	Yes	Yes	Yes	No
Electric generating equipment	Yes	Yes	Yes	No
Accessory electric equipment	Yes	Yes	Yes	No
Miscellaneous power plant equipment	Yes	Yes	Yes	No
Power plant structures and grounds	Yes	No	No	No
Total maintenance				

Table II—Increment Generating Costs in Mills per Net Kilowatt-Hour

Units in Service	Turbine Units Nos. 3 and 4				
Load range, megawatts	9.1–18.5	9.1–18.5	18.5–21.5	18.5–21.5	21.5–24.6
Increase on	No. 3 Prim.	No. 3 Prim.	No. 4 Sec.	No. 4 Sec.	No. 3 Sec.
755-hp. boilers	4–4	3–3	4–4	3–3	4–4
600-hp. boilers	0–3	2–3	3–3	3–3	3–3
525-hp. boilers	0–0	0–2	0–2	2–3	2–3
Rates Adding Boiler					
Generating coal	4.50	4.50	4.66	4.89	5.85
*Banking coal	.033	.030	.056	0.28	0.26
Total coal	4.83	4.80	5.22	5.17	6.11
Boiler maintenance	0.25	0.25	0.30	0.30	0.30
Boiler labor	0.0	0.0	0.0	0.0	0.0
Water cost	0.0	0.0	0.0	0.0	0.0
Chemical cost	0.01	0.01	0.01	0.01	0.01
Total cost	5.09	5.06	5.53	5.48	6.42
Rates without Adding Boiler and Excluding Boiler Intercept					
Generating coal	4.07	4.34	4.76	5.11	6.13
Boiler maintenance	0.25	0.25	0.30	0.30	0.30
Boiler labor	0.0	0.0	0.0	0.0	0.0
Water costs	0.0	0.0	0.0	0.0	0.0
Chemical costs	0.01	0.01	0.01	0.01	0.01
Total costs	4.33	4.60	5.07	5.42	6.44

* Banking charge is based on a generation of 70 hours per week and boilers banked 98 hours per week. Turbine intercepts, turbine and boiler starting charges not included in above rates.

plies to turbine intercept charges; that is, where a turbine is already on the line for some specific purpose any additional generation from the unit should be charged only at the increment rate, excluding the turbine intercept.

Increment costs developed for an increase in load apply equally well to decrement costs for a decreasing load.

Determination of water and chemical costs

Data from turbine Willans' lines may be used in a similar manner for the determination of intercept and increment costs for city water and chemical treatment of feedwater. Knowing the pounds of city water required and the cost of the water, it is a simple matter to convert into mills per kilowatt-hour or dollars per hour for an intercept cost. This item is naturally of a much greater magnitude for jet condensing turbines than for surface condensing.

In determining the fundamental data for turbine, boiler and station Willans' lines it is, of course, much more desirable (in the interests of accuracy) to use actual test data accumulated in regular plant operation than manufacturer's guarantee data. However, in dealing with smaller plants where test crews are not available to obtain the required data, the only recourse is to use manufacturer's data in the computation of station performance. In this connection it is the writer's practice to use a correction factor for turbine steam consumption of one-half of 1 per cent increase per year of age up to a maximum of 5 per cent over the original manufacturer's guarantee.

As a check against the accuracy of all fuel data used in the compilation of incremental cost data, each plant's theoretical fuel consumption is calculated every month and the result compared with the actual consumption. Fig. 2 gives a graphical record of such a comparison over a period of years for several plants and in general shows a fair degree of agreement between the calculated and actual results.

Such a comparison also serves as an excellent check on the general plant operation from month to month. Even though the calculated data may not be absolutely correct, the trend of deviations of actual fuel consumption from the theoretical are a good indication as to the relative performance of a given steam plant. Mistakes in operation are often discovered and corrected by this method.

Determination of maintenance costs

The accurate determination of the fixed and variable elements of maintenance costs is probably the most difficult problem in connection with the whole subject of increment costs. Over-all average maintenance costs for boilers, turbines and other equipment are, of course, easily obtainable from the accounting records, but the real problem consists of breaking down these average costs. This is largely a matter of individual judgment.

The effect of station capacity on maintenance is again largely a question of station design and is fixed over considerable periods of time. Therefore, the effect on maintenance costs of station capacity may be looked upon as a constant of so many dollars per kilowatt per year.

"Peak Prepared For" influences all maintenance costs except power plant structures and grounds. The greater the peak prepared for the greater the cost of maintenance over and above the fixed maintenance costs established by "Station Capacity." The most important of these

[*Continued on page 125*]

Turbine Data

No. 3 Turbine

Intercept	Per Hour	
Fuel	$3.26	Starting cost = $2.08
Maintenance	0.44	
Water	0	
Total intercept	$3.70	

No. 4 Turbine

Intercept	Per Hour	
Fuel	$3.74	Starting cost = $2.08
Maintenance	0.44	
Water	0	
Total intercept	$4.18	
755 hp. boiler intercept = $0.85		Starting cost = $6.07
600 hp. boiler intercept = $0.67		Starting cost = $4.80
525 hp. boiler intercept = $0.59		Starting cost = $4.16

Incremental Coal Cost

Contract price at tidewater	$6.20 per gross ton
Freight, tidewater to plant	0.75 per gross ton
Cost of coal at plant	$6.95 per gross ton
Handling	0.05 per gross ton
Shrinkage	0.17 per gross ton
Moisture adjustment 14,300 B.t.u. as received	0.10 per gross ton
Total cost at 14,500 B.t.u. per pound	$7.17 per gross ton
Or	3.20 mills per pound

Cooler Buses With Vents

By E. A. CHILDERHOSE* • • • H. P. TURNER

Head of Electrical Section
U. S. Army Engineering Office, Eastport, Maine

Central Station Division
Westinghouse Electric & Mfg. Co., Providence, R. I.

A TEST several years ago showed that an inclosed bus had approximately 60 per cent of the carrying capacity of a similar structure in the open-still air. Natural ventilation by means of 2-in. slots in the top and bottom of the cell, and on the same side, increased the bus capacity 25 to 35 per cent, so that it carried approximately 80 per cent of the current carried by a similar bus structure in the open air at the same ultimate temperature.

The test was undertaken for the purpose of checking the heating of the bar combination and arrangement tentatively selected rather than to determine the carrying capacity of different configurations of bars. Copper structural shapes were unavailable commercially at the time.

The bus was to carry 3,200 amp. at 13.8 kv. The phases were arranged vertically, spaced 24 in. center to center, each in a compartment 20 x 20 in. in cross-section and separated horizontally by 4-in. precast concrete slabs. Bus supports were mounted on the vertical concrete wall at the back of the compartments.

[*Continued on page 123*]

* Since senior engineer Federal Power Commission.

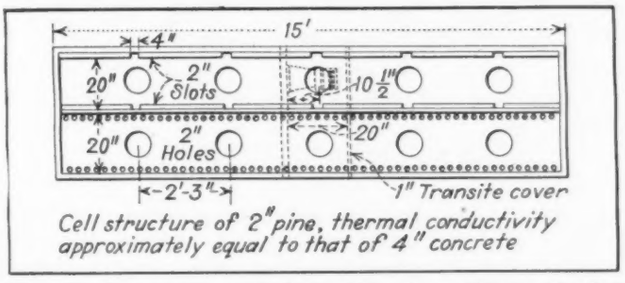


Fig. 1—Copper bus tested in 2-in. pine cells to simulate 4-in. concrete

The bus comprised four ¼ x 4-in. vertical bars, arranged in pairs with a ¼-in. between the bars in each pair. Space between two pairs adjustable from ¼-in. to 3¼-in. to determine the temperature rise at different spacings. Tests also run with four ¼ x 4-in. bars in the lower phase and four ¼ x 5-in. bars in the upper phase, all arranged horizontally with a 3-in. separation between pairs of bars. Insulator clamps are half iron, half brass, with non-magnetic bolts. Temperatures measured with thermocouples and all temperatures are hottest spots measured.

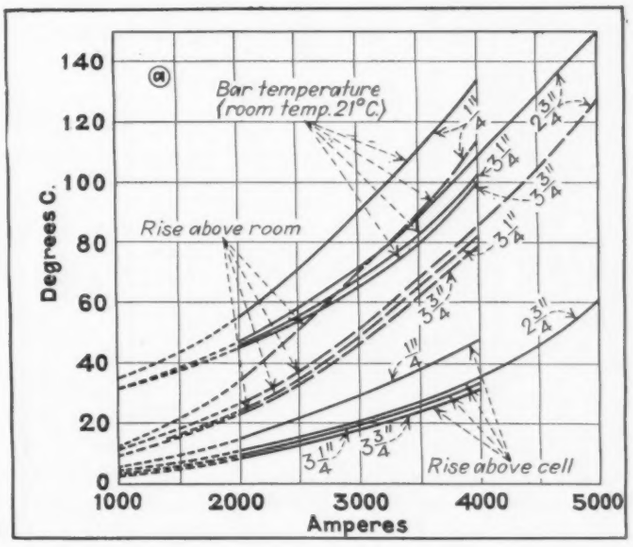
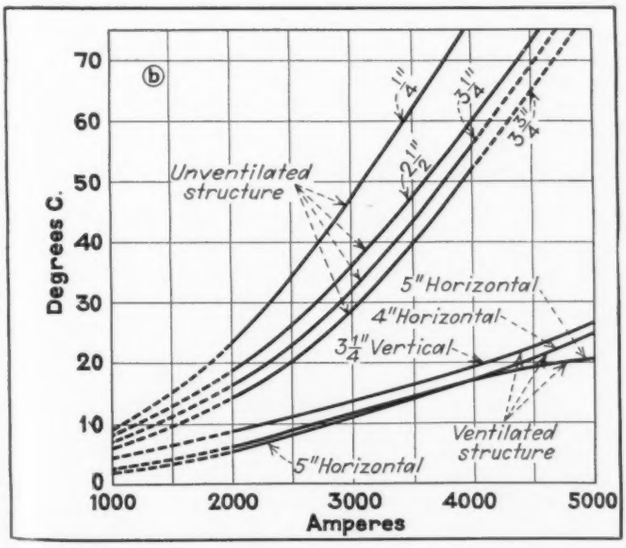
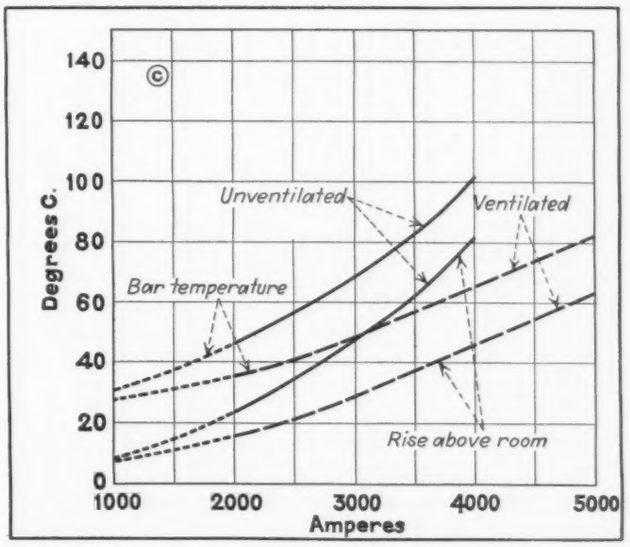


Fig. 2—Ventilation lowers bus structure temperatures

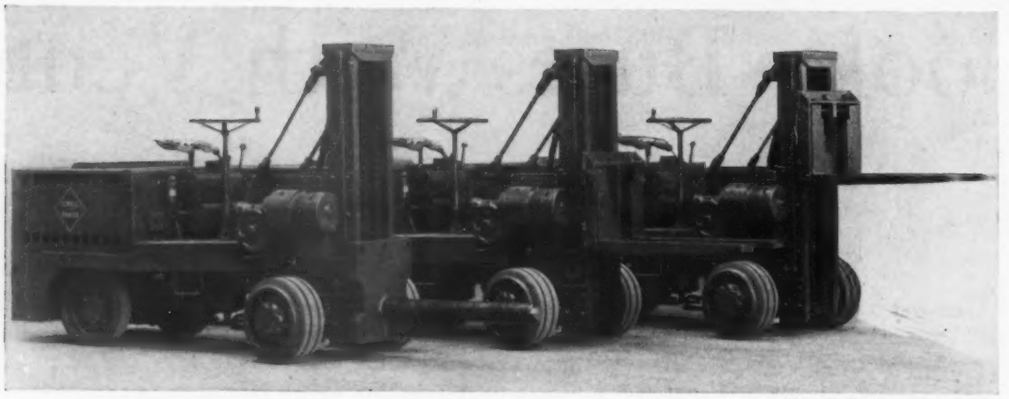




(a) Hot spot temperatures of ¼-in. vertical copper bars arranged in pairs, ¼-in. between bars, spacing between pairs as shown. Unventilated 2-in. wood cell structure.

(b) Temperature rise of top of cell above room, ¼ x 4-in. copper bars vertical (except as noted); 2-in. wood cell structure ventilated and unventilated. (c) Bar temperatures and rise above room, ventilated and unventilated, four ¼ x 4-in. vertical copper bars arranged in pairs, ¼-in. between bars, 3¼-in. between pairs.

Ram and fork trucks



Elwell Parker Electric Co.

Electrical Equipment for Battery Trucks—II

By GEORGE H. HALL
Douglaston, N. Y.

EARLY battery trucks were of the high-platform design, virtually similar to the familiar hand truck, with the addition of a storage battery, motor and control. For general utility purposes the high-platform truck is still largely employed for handling materials of a miscellaneous nature. Its broad, open platform provides ample space for irregular and long pieces and delivers them at a height that is convenient for unloading. Handling material with such a truck requires that the pieces be manually raised to the height of the platform, about 20 in., and placed thereon.

Drop-frame trucks

On the other hand, for handling many classes of material, such as barrels and drums, the necessity of raising them to the height of the high platform may be obviated by the use of low-platform, or drop-frame, trucks, in which the platform is but 11 or 12 in. above the floor level. This is accomplished by placing small wheels under the platform itself and locating the larger, or driving, wheels forward of the platform where they do not interfere with the platform surface. The battery, instead of being located beneath the platform, as with the high-platform truck, is contained in a compartment above the driving wheels and the controller is mounted on the front of this compartment in a position convenient to the operator as he stands on his platform.

An inherent objection to the use of the straight platform trucks above described is that they must remain idle during the process of loading and unloading. This objection gave rise to the development of the elevating-platform truck, in which the platform may be raised and lowered.

The material to be handled by this type of truck is loaded onto wooden or steel skids which are so designed that the platform of the truck may be slid under them between the side pieces or feet. The truck having been placed in this position, the platform is then raised 3 or 4 in. by motor power, or by the operation of a foot lever, so that the skid with its load is lifted clear of the floor and the truck is free to move to any point to which the material is to be conveyed. A reversal of the lifting motor, or release of the foot lever, then allows the platform to descend and the skid to be placed upon the floor. The truck may then move on to the next job awaiting it while the skid is unloaded at convenience. Such a truck is designated as a low-lift truck.

A further development is found in the high-lift truck, in which the platform is raised, by motor power, to any desired height within the limits of the truck's construction. In this form trucks may be used not only for transporting material but for piling and stacking it to considerable heights.

High-lift trucks

Modifications of the high-lift truck are made in a number of forms to accommodate them to more or less special classes of work. In the ram truck, which finds its main field of employment in plants making strip steel, wire and hollow ingots, the lifting platform is replaced by a heavy horizontal arbor which is run into the center of the coil or ingot in a manner similar to that in which the lift platform is run under the skids. The lifting mechanism then provides for raising the load for transportation and the high lift allows it to be deposited at any height, within the truck's limit, that may be desired.

The fork truck operates on a principle similar to the lift truck but, due to the absence of wheels under the fork which replaces the

platform, it may be used for raising heavy or irregular pieces directly from the floor. In some designs the fork may be tilted at an angle so that, when the load is in place, the tilted position prevents it from falling from the fork during transportation.

Crane trucks are provided with swinging booms in place of platforms and are widely employed for the conveyance and lifting of all kinds and shapes of materials that cannot be as conveniently handled by any of the platform or fork types of trucks. The crane is operated by an independent hoisting motor and, in some of the larger sizes, a second motor is used for swinging the boom. Crane trucks are largely used in foundries for lifting and placing molds and cores and for handling castings.

Baker-Raulang Co.

Crane trucks find a variety of jobs around the foundry for setting cores and molds and handling castings

In addition to the standard types of trucks above enumerated, special trucks for specific purposes may be advantageously employed in cases where the volume of special service warrants the expense of such construction and the devotion of a truck to a single purpose. An extremely heavy special type of truck is used for moving large reels of wire and cable around the wire plant and for delivering them to freight cars. When provided with a motorized apron, in lieu of a platform, high-lift trucks are used in paper mills and printing establishments for transporting, stacking and delivering to the presses the heavy webs of paper. Trucks may also be fitted with dump hoppers for carrying small articles in bulk and building materials such as sand, gravel and cement.

Battery tractors

In many manufacturing plants, and for interplant movement of material, battery tractors fulfill the duty of trucks with a saving of the expense of a battery and motor equipment for each truck. The function of the tractor is wholly that of traction rather than of load carrying, as the material to be transported is loaded onto wheeled trailer trucks, or into wheeled cars, trains of which up to any reasonable number are drawn by the tractor. No time is lost by the tractor in waiting for loading or unloading so that a single tractor may be kept in continuous operation delivering loaded trucks and returning "empties."

The electrical equipment of the tractor is similar to that of the battery truck, the basic elements consisting of the motor, control and battery, the latter being contained in a compartment which constitutes the larger part of the tractor. Since

[*Continued on page 129*]

Crescent Truck Co.

Mercury Mfg. Co.

Left—Barrels, drums and other material are easily placed on the low platform, making them more desirable for some applications than high-platform trucks. Right—Low-lift trucks pick both skid and skid-load clear of the floor

Curtain Rises on National Adequate Wiring Program

Broad promotional plan provides flexibility necessary for local application

"ADEQUATE WIRING—It Serves —It Saves." Under this banner the electrical industry is prepared to march forward in a campaign designed to break the bottle-neck of inadequate wiring installations and render, at the same time, a greater public service.

All branches of the electrical industry, for more than a year, have been planning a great co-operative effort and the National Adequate Wiring Program, now formally launched, offers to the industry a sound and constructive plan of operation for both national and local use to promote adequate residential wiring. With funds for national promotion and for field activities supplied by members of the National Electrical Manufacturers Association, the National Adequate Wiring Program is ready to proceed under the joint sponsorship of the Edison Electric Institute, the International Association of Electrical Leagues, the National Electrical Contractors Association, the National Electrical Wholesalers Association and the National Electrical Manufacturers Association.

To synchronize all efforts

This is the first all-industry effort to promote wiring adequacy in the home. The major objective of the National Adequate Wiring Program will be to synchronize all of the activities of the various interested groups, either in connection with plans in which wiring plays a logical part or in the actual promotion of wiring installations.

Now in progress of distribution are: The general Plan Book and a Certification Plan Book, which describe in detail the complete plan, its purposes, its methods of operation and the various promotional material available to utility companies and other groups desirous of tying in with this broad national effort. It will be noted that in the general Plan Book the national program is outlined and is seen to be basically a program of general education and sales promotion. The Certification Plan Book, on the other hand, is distributed on request and describes those special phases of the program which are applicable in those communities which undertake a local program. This is based upon the certification of homes which are wired up to the local adequate wiring standards provided they are approved by the national bureau.

Noteworthy in this broad national program is the effort that has been made to develop a completely flexible national program. In this way it can be practical for any community and for any type of activity or any scope of activity which may be desirable locally. Accordingly, therefore, the certification feature of the national program is merely a specialized form of the national program that may be adopted by local groups, should they so desire.

In short, the national adequate wiring program effort will be exerted along two parallel lines: (1) Educational information, promotion and advertising, conducted both on a national scale and through local Adequate Wiring Bureaus for the purpose of educating the general public. (2) Organization by the industry and allied industries forces for sales.

It is anticipated that national headquarters will carry on a continuing program of educational news service directed to the public to take the form of articles and releases designed for editorial use in national publications, for selected newspapers and for radio features for use by speakers on home economic subjects. National advertising support is anticipated through a tie-in between national advertising of prominent electrical manufacturers and the national program.

Flexible local programs

Particularly commendable is the attention which has been given to the practical solution of the adequate wiring program from a local standpoint. It will be seen that the Plan Book of the National Adequate Wiring Program devotes considerable attention to the local organization set-up and in addition there have been designed for local use a number of promotional and advertising pieces.

The Plan Book emphasizes that no set form for a local bureau can be recommended and that, on the other hand, the local organization, the service area and personnel in the local situation should all be built around and designed for the needs in the local territory. It is advocated that in the local bureau, however, all branches of the local electrical industry should be included, and the local organizer is admonished to select as leaders those who have had sufficient ex-

NATIONAL ADEQUATE WIRING PROGRAM

On pages 81–88 inclusive of this issue there is published a special section devoted to the significance of adequate wiring to the public utility industry today.

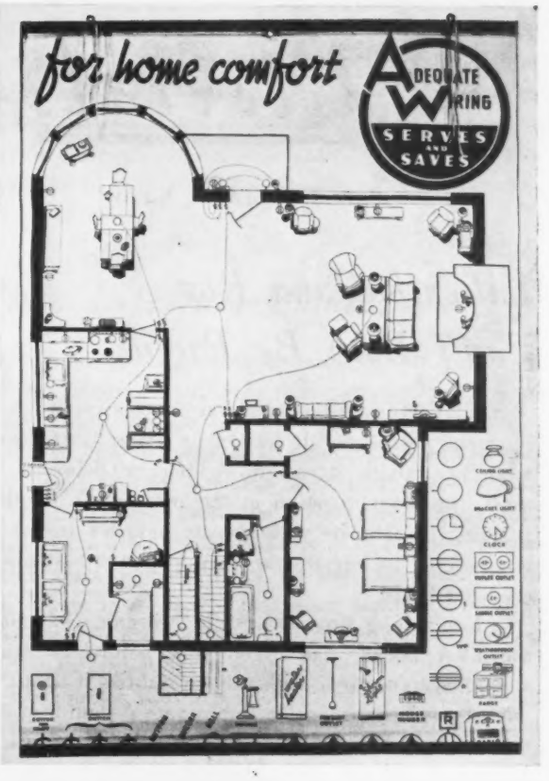
perience and, at the same time, can give the time necessary to do the work thoroughly. In line with its previously described complete organization, local bureaus are advised to keep the employees of all local electrical concerns informed of the activity and, if possible, to have them participate actively in its various phases.

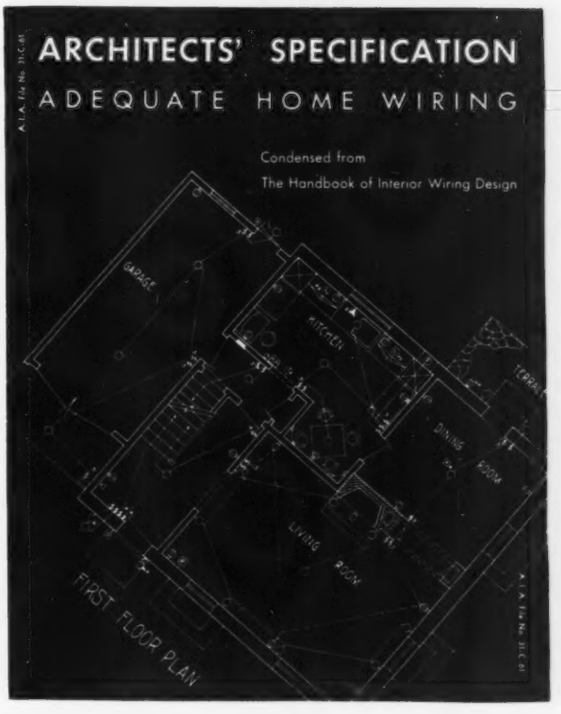
With respect to the promotional and advertising material which is now available for local use there might be mentioned: The national emblem and slogan, which are reproduced in this number of ELECTRICAL WORLD; direct mail material, newspaper advertising mats, a 24-page pictorial primer, sound slide films, electric charts, a householder's digest of the handbook, an architect's digest of the handbook, display poster, consumer leaflet, payroll stuffers and bulletin board posters.

The sound slide film, which will be entitled "Power for Living," is intended to be shown at lecture meetings, conducted by the utility companies, and is now in process of completion. With the sound slide film it is planned that a 24-page booklet entitled "Pictorial Primer on Adequate Wiring" will be available for distribution at the meetings. The primer, as the name suggests, presents in very elementary form the story of the power path and gives the reader the basic idea which is to "make the power path adequate all the way through adequate wiring." It points out the bottleneck which may be interposed between huge generating plants and large transmission systems and the home by a small entrance switch and inadequate wiring in the home.

Available for lectures is a large graphic chart (see this page) which shows the complete floor plan, including the furniture, wiring design and marginal symbols, but designed in such elementary form that it is easily assimilated by consumers, by building contractors and other groups who are not trained particularly along electrical lines. The handbook, entitled "Check Your Wiring," is readily adaptable for direct mail use by utility companies.

Much of the resistance which has been experienced by utility companies in the past in selling the architect upon the necessity of adequate wiring may be dispelled by the use of a new digest of the residential section in the Handbook of Interior Wiring Design specifically for architects. The residential wiring specification of the handbook has been published in a sixteen-page manual and presents the specification in the language of the architect. A large display poster in four colors has been designed for use in company stores and in company store windows (see page 82). A consumer leaflet, a four-page, two-color leaflet, is designed to be inclosed in package shipments by the company and presents a simple outline of the value of adequate wiring in terms of utilization.





Very important are the basic elements of the certification plan, which comprises one of the fundamentals of the entire Adequate Wiring Program. They are as follows: (1) A specification for local use approved by the National Adequate Wiring Bureau. (2) A license to operate the certification plan on the basis of an approved local wiring standard. This license is granted by the National Adequate Wiring Bureau. (3) Promotional material to aid in educating the public to the benefits to be derived from an adequately wired home. (4) Local field service to promote the certification plan by personal contact to take care of inspection of installations and to see that the certificates are awarded and identification emblems are permanently affixed to the property.

Uniform operation and uniform application of the certification plan will be achieved through the issuance of licenses to local bureaus by national headquarters and application for these licenses is to be made upon a form provided by the national committee and is to be accompanied by the specification pro-

[*Continued on page 128*]

Editorials

S. B. WILLIAMS, Editor

Lilienthal and Ross Can't Both Be Right

IS THE Administration about to clarify the government position with respect to power? It does not seem as though it can now long be delayed. The most important question at the moment is whether it is going to compete with private industry in the same territory or to buy up the private power systems, and on what basis.

For a long time Dr. A. E. Morgan, chairman of the TVA board, has urged that before government attempted to compete with private utilities it try to work out a basis for purchasing the private system that is fair to both sides. He has been opposed in this policy by Lilienthal and the other Morgan.

Wendell L. Willkie of Commonwealth & Southern has offered to sell the whole Tennessee system, but Lilienthal wants to buy only the part he needs. In the meantime, the cities in the affected areas are becoming just as anxious for a decision as are the power companies. If there is to be competition and all of the attendant waste and loss it is not going to be TVA that foots the bill, but cities with competition.

Accordingly, John R. Neal, a public power advocate of Knoxville, asked J. D. Ross, Bonneville administrator, what plan was followed in purchasing power systems in certain similar situations. Mr. Ross' reply discloses a policy identical with that previously announced by Dr. A. E. Morgan.

Ross advocates not only the purchase of an entire system but also "as a going concern." This is quite different from the "second-hand" value that Rankin (Norris' alter ego in the House) would allow. If this is the plan that the government is going to follow in the Northwest, why isn't it a good plan for the Southeast?

Ross stated in his letter that competition and duplication in Seattle costs $3,000,000 yearly. Are the cities of the TVA area willing to pay any such price for the privilege of buying TVA power?

Lilienthal has tried to discredit Dr. Morgan as being a friend of the utilities, but he can't so accuse Ross. While Ross' statement upholds Dr. Morgan and discredits the Lilienthal policy as being unfair, wasteful and imprudent, the utilities cannot be accused that it was prepared at their behest or connivance.

Right now the issue is directly up to the government. It is possible that the President may again try to duck the issue, as he has so many times in the past, by appointing another "National Power Policy Committee," but surely he is too smart politically to think that he "can fool all of the people all of the time." Certainly we can't have one policy for the Northwest and another for the Southeast.

If the Morgan-Ross policy is right, and we can't see any other that is, the sooner the government signifies its acceptance of that policy the sooner can the problems between the utility industry and the government be ironed out. Although the ultimate aim of both Morgan and Ross is the ownership by government of utility services, their policy provides for such an orderly transfer of ownership as not to discourage the investment necessary meanwhile to maintain growth.

•

The Utility Stake in Air Conditioning

SOME recent estimates by Dr. Willis H. Carrier place the present connected load of air-conditioning apparatus at 1,000,000 hp. with an annual consumption of 750,000,000 kw.-hr. At the current rate of growth this connected load by 1948 will be 10,000,000 hp. and the energy consumption, at the same ratio, 7,500,000,000 kw.-hr.

These figures would be more enticing to utility men were it not for the fact that while consumption is almost equally divided between summer and year-round use, the summer load is from four to five times that of the year-round load. This increased summer air-conditioning load has brought in some places a peak at a time when utility people have been accustomed to having a valley. It has disrupted schedules for equipment overhaul. Nor has the load always been compensatory.

Nevertheless, as shown above, the load is growing by leaps and bounds. It is rapidly becoming one of the most important single loads from the standpoint of volume of energy needed for its service. For that reason the utility industry has an important stake in the proper promotion and development of this market.

Not only is the utility interested in building a profitable load but it wants to be sure that its customers are well served. The utility, therefore, can be expected to co-operate with such manufacturers and dealers as sell reliable equipment and can provide proper servicing.

Whether the load is compensatory or not rests to a considerable degree in the utility's own hands. As probably the strongest force for local promotion, it can promote greater diversity, more year-round usage, storage systems, etc. At the same time it can revise its rates if they have been found to be too low.

The very size of the load and its rapid growth should stimulate the utilities to overcome such difficulties as do exist and to make air conditioning another means of building desirable load.

Fifty Years of Service

AT ITS midwinter meeting earlier in the month N.E.M.A. honored those of its members who had been continuously engaged in the industry for fifty years. There were six of these pioneers who had worked in the industry almost since its beginning.

Those six men whom N.E.M.A. honored have not only spent a half a century with the industry but they have also been leaders who have contributed personally to the progress of the electrical business. We salute these pioneers and we salute N.E.M.A. for recognizing their years of service.

We salute, also, the electrical industry, which by honoring these men also took recognition of its own arrival among the ranks of those industries of long and honored histories.

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Steam-Driven Auxiliaries Are Increasing

A STUDY of the plans of the new superposed plants in operation or under construction impresses one with the number of steam-driven auxiliaries that are employed. A few years ago the trend was definitely toward the use of electrically driven pumps, fans, etc. This renewed interest in a former type of auxiliary drive is due to a combination of conditions.

Large capacity boilers operating at high pressures require feed pumps and forced and induced draft fans of greater capacity than heretofore. Similarly, large generating units require circulating water pumps of increased capacity. The turbine drives of such auxiliaries are in the range of capacity where manufacturers have been able to construct rugged, reliable machines with a much higher economy than the auxiliary turbines of former days. Also, turbine drives have a high degree of flexibility and speed control is a comparatively simple problem.

Nevertheless, the extended use of turbine-driven auxiliaries in these superposed stations does not appear to be so much due to the above-mentioned characteristics as to two other factors which may not be present in a completely new high-pressure plant.

In the first place, the larger the capacity of the superposed unit the more efficient it will be. Hence, all possible steam is passed first through the new superposed turbine, then through either the low-pressure unit or the auxiliary turbines. The steam is used at high efficiency in the superposed unit and at moderate efficiency in the lower pressure auxiliary turbine. Considering generator, transformer, transmission and motor losses with electrical-driven, variable-speed auxiliaries, this steam performance makes a creditable showing as compared to electric drives.

A second factor is that many of the older plants which are being superposed have inadequate extraction feedwater heating or in some cases have none at all. Certain of the larger auxiliary turbines can be designed solely for extraction feedwater heating at a number of stages. This arrangement tends to increase the cycle efficiency of the whole plant and increase the desirability of such feed-heating units.

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When Inflation Comes

ONCE more the papers are full of the prospects for inflation. A year ago, when prices were quickly rising, people wondered if that was the beginning of the long-heralded inflation. Then prices broke and abruptly business went into a sharp tailspin of deflation. Now the President suggests that certain prices are too low. Money is to be made easier through releasing restriction on the gold sterilization fund. There is an increasing clamor that the President be required to exercise his right to issue more dollars. And public spending for relief increases.

Economists who are sincere students of the monetary situation are of one accord, that ultimately we must have some degree of inflation. Where they don't agree is as to time and extent. Obviously a nation cannot continue to spend more than it takes in indefinitely. Sooner or later there must be a reckoning. Likewise certain values, such as labor hours and wages, cannot be quickly raised without raising other values and at the same time reducing the purchasing power of fixed units such as dollars, bonds, life insurance money.

And that is one of the problems that any regulated industry, such as utilities, has to study carefully. So far rates have appeared to be like ratchets—move easily only in one direction. Wages are definitely higher and can be expected to increase; the same is true of coal, supplies and taxes. New construction will cost more as materials and labor go higher. How far can management go with economies in order to meet higher costs out of lower rates?

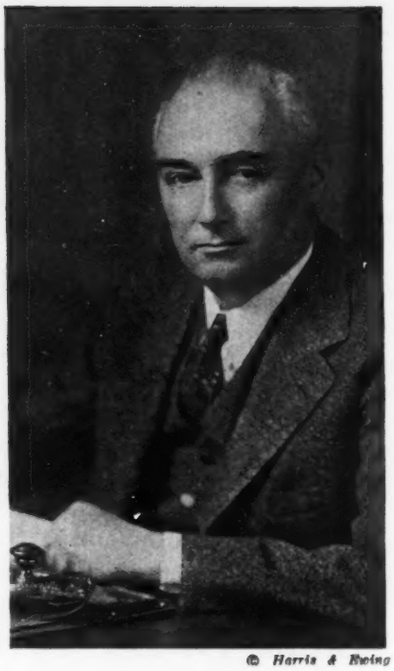
Unless inflation, when it comes, gets out of hand, we know that the regulatory bodies will resist any attempt to raise rates. That has already been proved in initial attempts by gas and telephone utilities.

While many operating economies are certain to be made, the real problem lies in the fixed charges—first, how to spread them over more output and, second, how to reduce them per unit of capacity. The first is the job of the sales department through selective selling and through load analysis to determine whether a rate is or is not compensatory. The second is the responsibility of the engineers that there be a more careful weighing of efficiency versus fixed charges.

These comments, of course, are based on the assumption that inflation will be orderly and progressive. Should it get out of hand, as it did in Germany, there are no rules.

The Customer Has No Choice

By CARTER FIELD



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This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

JUST a soup-spilling waiter. A big yellow boy from Alabam'. No more memory of what the customers ordered than a rabbit. And very small regard for the "white trash" he served. That was Sam, a waiter in the Senate restaurant a while back.

The manager was patient. Time and again he overlooked obviously justified complaints, winked at violations of the rules, even on patent short-changing graft. But finally Sam came to feel his oats. He sassed the customers—bawled them out if they complained.

So the manager fired him.

"Never again," he told me sadly a little later, "will I attempt to fire one of these waiters. They can bring cleavers to the tables and use them on the customers, but it will be all right with me. Sam's case gave me too much trouble. I don't know why Senator Blank thinks so much of him. I don't care. I have learned a lesson. This isn't a business institution. It's government ownership."

The Senate restaurant has never paid. Is not expected to pay. But then, to be fair, neither do most club restaurants. Yet a cafeteria over in the Methodist Building, more than a long block away, and up against the difficulty that its business dwindles on rainy days because most of its regular customers can reach the Capitol restaurants without getting wet, makes a nice profit. And, incidentally, serves better food. Much better.

The answer is very simple. It applies to every phase of government ownership. The cafeteria is a business—run by business people. It has to pay or close down. So the folks in charge see to it that it does pay. It has to please its customers or they don't come back. So it *does* please its customers. The Senate restaurant is a "public service." Every busboy gets his place because he knows somebody who knows a senator. If he knows a senator himself, pretty soon he is promoted to waiter.

The Senate cafe is not a bad restaurant. On the contrary, it is a pretty fair one. But if it had to charge each customer enough so that it could pay its own expenses there would be no customers. And this would be true even if it didn't get its rent, light and heat free. But it does not have to do this. It is a public service institution, so its deficits are charged against the public purse. Which means that you and I and everybody who pays income taxes, or smokes cigarettes, or takes a drink, or goes to theater, or, for that matter, who buys bread, helps to pay for it.

Value for the money

Right there is a factor which most of the folks who call themselves progressive, overlook. When the private individual is spending his own money he has considerable to say about any given purchase. He decides whether it is worth what it costs him. He decides—and this is really the vital difference—whether the same money spent in some other way would not yield him more satisfaction.

Private management of every sort of business realizes this. In its advertising it does its utmost to persuade the possible customer. Sometimes it persuades him when a refusal would show better judgment. But the blood is on his own head. He made the decision. He had his free choice.

When the government is conferring benefits on its subjects no such choice is possible.

John Taxpayer must take it and like it, when the government is spending for his benefit. Once the "service" is started by a benevolent government he never has a chance to say. Government functions, like government bureaus, do not die, once established.

One of the most successful of the publicly operated municipal electric systems is in Seattle. Its former manager, J. D. Ross, was picked because of his conspicuous success in this public ownership and operation field for his present post as administrator of the great Bonneville project.

Seattle's rates to domestic consumers are higher than those of Washington, D. C.! Yet the Potomac Electric Company at the capital produces its current from steam. But that's only part of it. The privately owned Washington company pays tremendous taxes to the federal government—15 per cent plus of all its net earnings—plus heavy taxes to support the local city government. It pays interest on its bonds and substantial dividends on its stock, which, in turn, contribute a heavy slice to the federal government in income taxes and to local governments, wherever the securities are held, in personal taxes. The Seattle company of course is practically tax exempt.

Generally, assuming a man like

[*Continued on page 127*]

News OF THE WEEK

Two Utility Systems Register With SEC Under Holding Company Act

Engineers Public Service and United Light & Power file compliance with provisions of measure — Utilities now registered total 40 per cent of industry — SEC Douglas pleased with actions of companies

Registration of Engineers Public Service Company and United Light & Power Company with the SEC under provisions of the utility holding company act brings the total of registered companies to 40 per cent of the industry.

This week Engineers Public Service filed with the SEC its declaration of registration and also announced that two of its subsidiary holding companies, the El Paso Electric Company of Delaware and the Western Public Service Company, had registered along with the parent company.

Plan corporate changes

Donald C. Barnes, recently elected president of Engineers, announced that the action had been taken at this time because it was deemed desirable "to effect without further delay" certain corporate changes in the system. He said that counsel had advised that such action could not be taken until after the company had registered with the SEC under the utility act.

Last week United Light & Power filed its registration statement with the SEC along with that of its subsidiaries.

The registration did not come as much of a surprise, having been expected by most observers since the registration nearly a year ago of its subsidiary, American Light & Traction Company. The two subsidiaries involved in the current registration are the United Light & Railways Company and the Continental Gas & Electric Corporation.

Naturally pleased with the registration, W. O. Douglas, chairman of the SEC., said: "We welcome this action on the part of Mr. McCain and his associates in the United Light & Power System. We regard it as an important contribution toward the elimination of obstacles to progress and to sound development in the utility industry."

The United Light & Power System, which includes 64 subsidiaries in seventeen states, has consolidated assets of approximately $570,541,432.

Pending the decision of the Supreme Court in the SEC hand-picked Electric Bond & Share case on the validity of the registration provision of the act, many utility holding companies have prepared the necessary data for SEC registration, in the event, as seems likely, that the court upholds the lower court ruling. The decision is hoped for some time this month, and it is possible that some large systems may "jump the gun" in the next few weeks and register with the commission under the act.

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General Electric Signs CIO Contract

A national agreement granting sole collective bargaining rights to the United Electrical, Radio and Machine Workers of America, a CIO affiliate, in all plants of the General Electric Company in which the union is designated as majority representative has been worked out by the company and the CIO group, according to a joint statement recently issued.

The contract, the first entered into by General Electric with any union on a national basis, will become operative in five plants with 27,000 employees as soon as it has been ratified by the CIO unions in the General Electric system.

Wages are affected only to the extent that the policy laid down in the General Electric employee booklet of March, 1937, of paying wage rates "equal to or higher than wage rates paid in community industries for comparable work requiring the same skill and efficiency" is written into the contract, and may be revised only after negotiations with the union. Strikes, lockouts and company unions are prohibited under the terms of the agreement. It is provided that grievances and disputes, unsettled through direct conferences, may be submitted by mutual agreement to outside arbitration.

Extension of the coverage of the contract to all of the company's 60,000 workers will depend on the union's ability to convince the management, through NLRB elections or proofs of membership, that it has the backing of a majority in each of the fifteen other plants.

•

Power Commission to Hold Niagara Falls Power Hearing

The Federal Power Commission has ordered hearings to be held March 16 on a petition filed by the New York State Power Authority in proceedings involving the Niagara Falls Power Company.

The hearing will be on the petition of the utility to amend its license so as to divert an additional 275 cu.ft. per second of Niagara River water through its project at Niagara Falls. The Power Authority has opposed the petition.

•

New Pension Plan Adopted by Connecticut Utility

Connecticut Light & Power Company has adopted a pension plan for its 2,300 employees effective March 1 which involves a blanket policy with the Aetna Life Insurance Company. Each employee who adopts the plan will be entitled to receive an annual pension when he reaches the age of 65. This, supplemented by what he will receive under the Social Security Act,

will approximate 2 per cent of all his earnings from March 1.

The company also plans, if possible, to add a suitable pension for past services antedating March 1. More than half the cost will be paid by the company. Should a participating employee leave the company, he or his beneficiary will be paid all the contributions he has made with interest compounded annually at 3 per cent.

•

Theft of Electricity Carries Term in Jail

The ruling by the Illinois Supreme Court that electricity is personal property paved the way for Judge Robert J. Dunne in Criminal Court, Chicago, to sentence Gust Menagas, owner of a restaurant, to from one to ten years in the penitentiary on a charge of grand larceny. Evidence showed that Menagas had stolen $3,200 worth of current.

Menagas was accused of diverting current during the last four years. He admitted he put a "jumper" on the meter to prevent most of the current used by him from being registered. He was indicted a year ago on complaint of Commonwealth Edison Company.

Attorneys stated that the conviction was the first in Illinois. Until now, the only legal recourse of the company has been to charges of violating a city ordinance prohibiting tampering with an electric meter. This was classified as a misdemeanor.

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Tax Law Unconstitutional

Judge Harry Hilgemann in Circuit Court at Fort Wayne, Ind., has handed down a decision finding the Indiana municipal utility tax unconstitutional. The decision was made in an injunction action attacking the 1933 utility tax law, brought by the city attorney of Fort Wayne.

The finding will save Fort Wayne $108,163 taxes on its electric utility, according to Mayor Harry W. Baals. An appeal from the decision was indicated when the state Attorney-General's office filed a formal exception to the ruling.

•

Board Postpones Hearing

FPC has postponed until March 2 hearing originally scheduled for February 14 on a proposal by the Oklahoma Gas & Electric Company to acquire the entire physical properties of the Western Light & Power Corporation. Postponement was made at the request of counsel of Western Light & Power.

Directors of Westinghouse Elect George H. Bucher As President

Frank A. Merrick, president since 1929, becomes vice-chairman — Changes announced by A. W. Robertson, chairman, following meeting of board of directors — Myler of Canadian unit elected a director

George H. Bucher. executive vice-president of Westinghouse Electric & Manufacturing Company, was elected president, to succeed Frank A. Merrick, president since 1929, who becomes vice-chairman, it was announced this week by A. W. Robertson, chairman,

George H. Bucher

following a meeting of the board of directors.

At the same time Paul Judson Myler, president of Canadian Westinghouse Company, was elected a director of Westinghouse Electric & Manufacturing Company.

Mr. Bucher and Mr. Merrick have both been with Westinghouse for many years. As a member of the graduate students' training course Mr. Bucher began his work with the company on September 1, 1909, in an assembly aisle in its East Pittsburgh plant. He worked successively as a coil winder, as a worker in the transformer assembly and as a motor-generator tester. He began at a wage of 18 cents an hour. By the end of his second year his wage had been increased to 20 cents an hour.

Born in Sunbury, Pa., Mr. Bucher was a graduate of the local high school, and then entered Pratt Institute, Brooklyn, to study machine design and electrical engineering.

While with the Westinghouse Electric International Company Mr. Bucher became interested in the problems of electrification in Japan and played an important part in expanding the activities of his company in Japan. In 1930 he was appointed assistant to the general manager of the International unit and in 1931 as assistant general manager, a position he held until 1932, when he was elected vice-president and general manager. In 1934 he was elected president and general manager of the International company. The following year he became vice-president of the parent company and in 1937 was named executive vice-president and a director.

Joined company in 1902

Mr. Merrick was born in Lambertville, N. J., and educated in electrical engineering at Lehigh University, where he was graduated in 1891. In the same year he entered the employ of the Thomson-Houston Electric Company and served successively as a consultant with the engineering firm of Blood & Hale, manager and chief engineer of the Steel Motor Company. When Steel Motor was absorbed by Westinghouse in 1902, Westinghouse officials considered that Mr. Merrick was one of the principal assets acquired in the deal.

When Canadian Westinghouse Company, Ltd., was formed the following year Mr. Merrick had charge of construction of its plant at Hamilton, Ont. He remained there as superintendent and later became, successively, manager, vice-president, general manager and director. For two years after the war Mr. Merrick was located in London as special representative of the company. He returned to Canada and in 1925 became vice-president and general manager of Westinghouse Electric & Manufacturing Company with offices at East Pittsburgh. In June, 1929 he was elected president.

Mr. Myler has long been associated with Westinghouse interests. Born in Pittsburgh, he entered the employ of Westinghouse Air Brake Company in 1866, became secretary of Westinghouse Manufacturing Company of Canada in 1896 and vice-president of the Canadian Westinghouse Company in 1903. He was elected president in 1917.

•

Will Cut Capitalization

Stockholders of the United Corporation have approved a proposal for reduction of the corporation's capital from $197,109,220 to $138,965,099.

Morgan Supports Ross Proposal on Purchase of Private Utilities

Bonneville Dam administrator declares "going concern" value should be considered when power company is taken over by government — TVA chairman strikes back at fellow directors on present policy

A showdown on the power policies of the Tennessee Valley Authority moved nearer reality last week as Dr. Arthur E. Morgan, TVA chairman, struck back at his fellow directors for continuing a policy of duplicating utility facilities and the drive to disrupt present systems by piecemeal purchases of the most profitable properties under the threat of competing operations with the aid of PWA funds.

In a letter to 35 Senators and Representatives Dr. Morgan indorsed a public power policy enunciated by J. D. Ross, Bonneville Dam administrator, and said that the proposals are "strikingly at variance with the policy now in operation in the TVA."

Cites Ross as an authority

Mr. Ross "as an unquestioned advocate and successful proponent of public power, who has personally experienced the enormous waste and the great bitterness which results from conflicts between public and private power systems, with duplication of facilities," Dr. Morgan said, "is in a position to speak with authority. No one can accuse him of being subservient to the utilities."

In a letter to Dr. John R. Neal of Knoxville Mr. Ross pointed out that any offer to purchase utility property must come from the public agency that wishes to buy. "Such an offer would be made after a study of the value of the property from all angles instead of merely from physical valuation. The question is not simply what is the value of a piece of wire or of a power house. It is what is the value as a going concern. The principal question is the value that can be given to buy out a competitor."

Mr. Ross also pointed out to Dr. Neal that the "entire holdings of a company should be taken over if possible. Taking only a part lowers the value of the remainder and introduces severance damages that raise the cost of that purchased." Mr. Ross said that the proposal of Wendell L. Willkie, president of Commonwealth & Southern, to sell all the system's properties in the Tennessee Valley was all that could be expected of him at this stage of the proceedings.

Commenting on the Ross letter, Dr. Morgan said that the policy enunciated "is substantially identical with that which I have advocated for the TVA, so far as they cover the same ground, ever since the first month of its life, a policy which was then and is now opposed by the TVA director who, invariably supported by the third member of the board, dictated the power policy." Dr. Morgan was speaking of David E. Lilienthal, power director, and Harcourt A. Morgan as the third member.

"I can support Mr. Ross's proposal in every respect without change, though my own proposals, while entirely agreeing with his in purport, varied in details as to methods. In practical details of operation various alternative methods might be almost equally acceptable. In its fundamental spirit Mr. Ross's proposals are strikingly at variance with the policy now in operation in the TVA.

"The fact that Mr. Ross proposes a solution practically identical with that which I have advocated for 4½ years throws light on the steadily maintained propaganda to the effect that my position is a surrender of the public interest and is unduly favorable to the utilities.

"In my opinion the TVA program as outlined in its legislation is fundamentally sound and, with correction in administrative methods, can continue to be of very great public value."

Dr. Morgan concurred in the statement of Mr. Ross, in the letter to Dr. Neal, that "no intermediate agency of the state or any other kind should ever come between your federal power plants and the public district or city, except temporarily in order to complete the transfer of property as the various cities and districts become organized to receive it, and to handle temporarily that property which may be common to more than one city or district."

Opposes compromise

Mr. Lilienthal, backed by public ownership advocates in Congress, has long been opposed to any compromise with the utilities in the TVA area. He has consistently advocated cities construct duplicate facilities for distribution of TVA power. Dr. Morgan has advocated a power policy which would not result in duplicating private systems, but their purchase in cases where municipalities desire to own their own power facilities. This conflict of views has resulted in a split in the TVA board which has led to demands for a Congressional investigation. Observers believe that the conflict will soon break out into a public airing.

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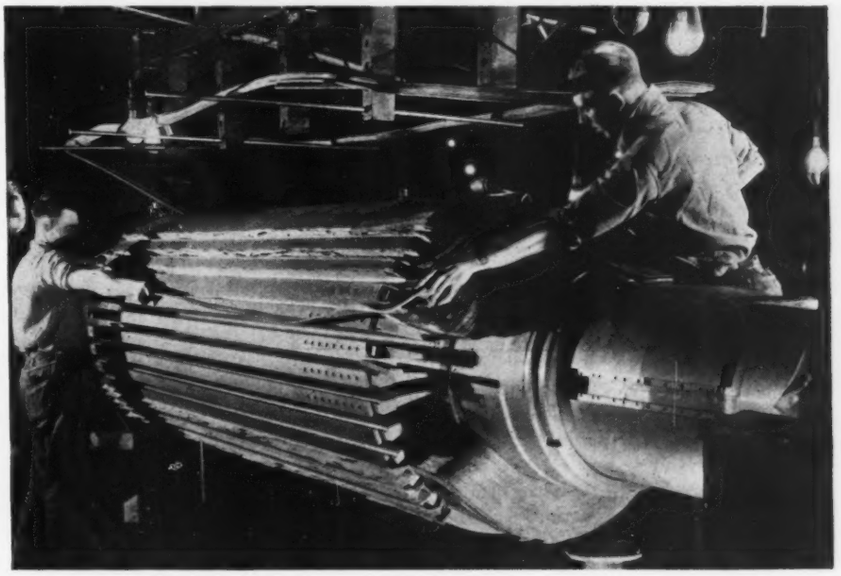
Seek New Industries

Towns in the federal-subsidized Buzzard Roost power project area of South Carolina have launched a campaign to attract manufacturing industries. It is also planned to build recreation and game centers with WPA help. Proposals have been made that the communities co-operate in the movement.



GENERATOR ROTOR—Winding the generator rotor of an 18,750-kw., 11,000-volt, three-phase, 25-cycle, 1,500-r.p.m. turbo-generator set being manufactured by Allis-Chalmers for the Williamsburg power plant in Brooklyn, N. Y.

Georgia Power Shows Appliance Units Gain

Merchandise sales of the Georgia Power Company in 1937 totaled $3,387,404, or an average of $22.35 for the 151,592 average number of residential customers. During the year the company showed an increase of more than 14,000 in the average number of customers. In 1936 the company reported average merchandise sales of $23.34 a customer. The Columbus division reported the highest individual sales of $32.35 a customer.

During December the company sold 58,399 Mazda lamps and for the year a total of 667,940. In both cases the quota was greatly exceeded.

Unit sales of popular electrical appliances were the highest in company history. Unit sales of the company show 6,476 ranges in 1937, against 6,646 in 1936; refrigerators, 8,379, against 6,428; water heaters, 4,106, against 3,965; washers, 1,871, against 1,413; portable lamps, 21,018, against 21,340; space heaters, 2,225, against 1,962; hand irons, 12,712, against 13,062; percolators, 6,021, against 3,665; toasters, 2,905, against 1,505.

The company stated that residential customers in 1937 used an average of 63 per cent more electric service than the average electrified home throughout the nation. The average was 1,313.4 kw.-hr., against the national average of 803 kw.-hr. It was reported that 65.3 per cent of the company's residential customers had electric refrigerators in use. The electric range saturation was 21.8 per cent and water heaters was 9.9 per cent.

•

Will Study Effects of Rates on Income

An order has been adopted by the Federal Power Commission calling for reports from electric utilities, both privately and publicly owned, of changes in annual revenues resulting from rate changes during the period from July 1, 1935, to December 31, 1937. These reports are to be filed with the commission by March 31.

"Receipt of these reports will permit, for the first time, a comprehensive compilation of the effects, throughout the United States, of rate changes on the income of companies or systems distributing and selling electric energy to customers of all classes in every state in the Union," acting Chairman Clyde L. Seavey explained.

"As these rate changes, in the large majority of instances, have been reductions, these reports will show particularly the estimated effect of lower rates on the revenues of both privately and publicly owned electric utilities."

When filed, the forms will show not only estimated changes in revenues in dollars and cents but also the number of customers of all classes affected by rate changes during the 2½-year period. This information, when secured, will be tabulated by states and geographic divisions so that it will be possible to determine what regions have been most affected by rate changes.

SALES TROPHY—Established by James B. Black, president of Pacific Gas & Electric Company, to signify the outstanding best over-all sales job of the year, this trophy has been awarded to the Shasta division for the best work in 1937. It is perpetual and will carry the name of each winning division. The divisions of the utility this year must shoot at a higher revenue goal on a smaller sales expenditure budget. In 1937 the expenditure budget was $1,748,000 and revenue $6,148,000. This year the budget is $1,209,000 with a goal of $7,286,000

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Georgia Commission Changes Policy on Utility Rate Cuts

A policy of obtaining rate reductions through conferences with utility officials instead of through "expensive hearings resulting from *rule nisis* to compel rate reductions" has been adopted by the Georgia Public Service Commission, according to Walter R. McDonald, chairman.

Latest conference scheduled by the commission is with the Georgia Power & Light Company, tentatively set for March 1.

Write-offs Are Shown by New York Utilities

Immediate and direct results of the mergers and consolidations of New York utilities during 1937 included writing out of more than $86,000,000 of fixed capital, the Public Service Commission stated in its annual report. The continuation of the trend for consolidation and simplification of corporate structures was held as one of the most significant features of the commission's activities.

The commission stated that other adjustments to be made of assets, in addition to the write-offs, would increase the total to more than $120,000,000. The mergers and consolidations resulted in rate cuts of more than $7,500,000 in annual savings.

The write-offs of fixed capital showed $70,000,000 for Consolidated Edison Company and about $11,000,000 in Associated Gas & Electric operating units.

The commission authorized utilities in the state under its jurisdiction to issue $258,654,237 in securities during 1937. The commission considered 92 applications last year, of which 73 were approved. In the past three years $933,259,406 in securities have been authorized.

•

Commission to Scrutinize Wholesale Rate Schedules

FPC has ordered the Gulf States Utilities Company, Engineers Public Service unit, to show cause on or before March 16 why a certain one of its wholesale rate schedules which would effect savings should not be applied for electric energy sold to the communities of Abbeville, Broussard and Erath, La.; the Louisiana Power & Light Company and the Gulf Public Service Company, instead of the various rates to those customers which are now in effect.

The commission issued its order after placing under scrutiny thirteen agreements under which the Gulf States Utilities Company sells electric energy at wholesale for resale to companies and municipalities.

•

Utilities' Legal Fees Total $14,500,000 in Six Years

Expenditures of 232 public utility companies in New York State for legal fees and expenses between January 1, 1931, and December 31, 1936, amounted to $14,500,000, according to an analysis made public by the New York Public Service Commission.

According to the analysis, three or four utility systems in the metropoli-

tan area accounted for about 65 per cent of the total for the entire state; 52 companies of the 232 reporting were shown to have spent 97 per cent of the total. Payments made by the American Telephone & Telegraph Company were excluded from the report, because of its interstate service.

•

Peoples Gas Light & Coke Granted Increase in Rates

Circuit Judge S. H. Klarkowski entered a decree last week granting the People Gas Light & Coke Company an immediate increase in its rates. A plea from the Illinois Commerce Commission that the case be referred to a special master for further evidence was overruled.

The rate increase decree will give the company about $2,500,000 additional net income annually after allowing for additional taxes and charges. The company voluntarily agreed to impound the additional revenues pending determination of the appeal from the decision which the commission will take to the higher courts.

•

Adds to Transit System

Citizens of Kansas City, Mo., will soon have an opportunity to ride trolley coaches in their city. Kansas City Public Service has decided to supplement its present facilities of street cars and buses with a fleet of 34 trolley coaches.

Bonneville Dam Power Allocation Differs from Elephant Butte Use

Power Commission figures 57 per cent of project costs should be charged to power facilities — Secretary Ickes figures 100 per cent of New Mexico irrigation project water rights as the power value

The value which the government allocates to power facilities in multiple projects, as in Bonneville Dam, varies widely from that in the case of the Elephant Butte project in New Mexico, it was disclosed in an analysis of the two projects.

In the case of Bonneville the Federal Power Commission figured that power development may fairly bear 32.5 per cent of the cost of facilities having joint value for the production of electric energy and other purposes. On this basis it was estimated that the total cost of joint facilities to June 30, including fishways, is $38,490,700.

Allocates power costs

The commission determined that $11,682,400 of the total estimated project cost of $53,188,800 to June 30 should be allocated to the initial power development and that of the estimated ultimate cost of $74,144,600 a total of $42,181,000 be allocated to power, or 57 per cent of the total cost of the entire project.

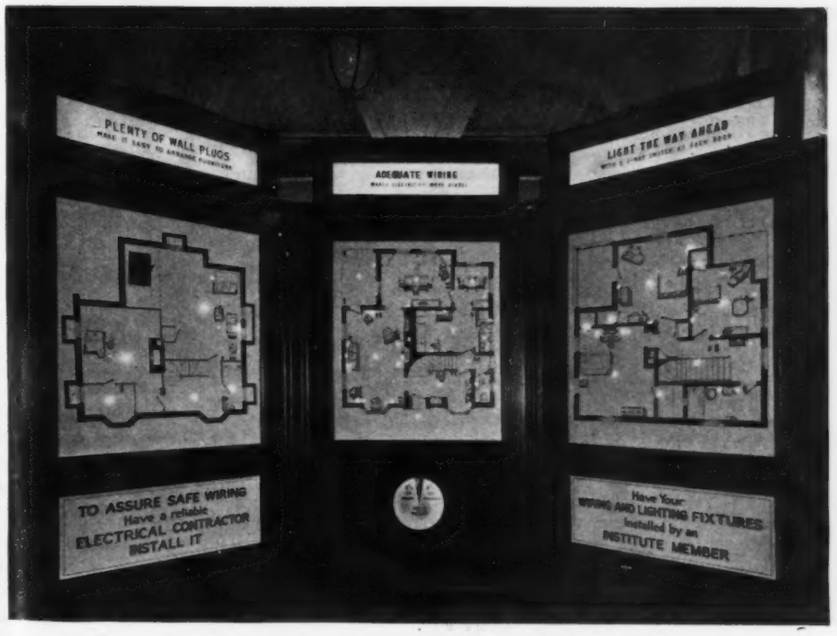
For some time there has been agitation for development of hydro-electric power at the Elephant Butte Dam, located on the Rio Grande in New Mexico 130 miles north of El Paso. This irrigation project cost $5,246,408, of which $1,000,000 was contributed by the federal government, the outgrowth of negotiations with the Mexican government. The water users of the project assumed the remainder of the debt.

Because all the water collected in the Elephant Butte reservoir is needed during the growing season it has not been feasible to develop firm power, since water could not be wasted in winter through the turbines unless facilities were provided for catching and again storing it for summer use.

In order to meet the water requirements, and at the same time generate power, the government is now constructing a $2,500,000 dam on the Rio Grande at Caballo, New Mexico, 100 miles above El Paso. In this way water released from Elephant Butte will be caught in the Caballo reservoir and later released for irrigation purposes during the growing season. It is anticipated that some power may be generated at Caballo.

Elephant Butte water users were not entirely sold on the proposed power project phase, so the Congress last year, as reported in H.R.6958, authorized the Secretary of the Interior to enter into a contract with the El Paso County Water Improvement District and the Elephant Butte Irrigation District by which the districts will be relieved of the obligation of making the payment of the construction cost chargeable to the development of power of Elephant Butte as determined as equitable by the Secretary of the Interior. This payment was to be made in return for conveying all title, interest, etc., over to the government.

Secretary Ickes has determined that $4,246,408, the entire debt of the water users, was the equitable amount chargeable to power. This represented the entire cost of the irrigation project assumed by the water users. In the case of Bonneville only 57 per cent of the total cost of the project was considered chargeable to power facilities, which includes the actual cost of power machinery and equipment. Observers point out the difference in power allocation.



ADEQUATE WIRING FOR WASHINGTON HOMES — Electric Institute of Washington, D. C., uses this illuminated working model to show Washington housewives the advantages of adequate wiring. Each lamp is controlled by appropriate switch mounted on board

North Central Group Holds Joint Meeting

Local conditions determine whether electrical power can be produced most economically by water or steam, C. C. Boswell, chief engineer of the Minnesota Power & Light Company, told the Minnesota section of the American Institute of Electrical Engineers meeting recently in Minneapolis. Mr. Boswell spoke at a session of electrical engineers held in connection with the North Central Electrical Convention. Among the speakers was W. T. Ryan, professor of electric power engineering at the University of Minnesota. Mr. Ryan told the group that efficient, municipally owned power plants were better yardsticks for measuring power rates than President Roosevelt's proposal that rates be determined on the TVA yardstick.

Adoption of the national electrical code throughout the state will cut cost of manufacturing and selling electrical appliances, Glenn Rowell, engineer for the Minneapolis Underwriters Inspection Bureau, declared at a rural electrification meeting.

•

Local Appliance Dealers to Form National Group

Formation of a national association of electrical household appliance dealers will be acted upon at a meeting to be held March 21 at the Hotel Commodore, New York. Russell Atkinson, formerly president of the Brooklyn Electrical Appliance Dealers Association, is temporary chairman of the organizing committee.

The new group, which is expected to be on a permanent organization basis to function by April, will represent a federation of the various local appliance groups throughout the country. Some twenty of these groups have signified their intention of sending delegates to the forthcoming convention, with an attendance of several hundred expected. A major objective will be the establishment of resale price maintenance and the betterment of fair trade practices.

•

Refutes Board's Authority

Michigan Public Utilities Commission is facing a challenge of its authority to adjudicate the petition of the Ontonagon Rural Electrification Co-operative for a fair and equitable wholesale rate for electricity purchased from the Wisconsin-Michigan Power Company. The utility contends that the commission had no authority because the complaint came from the co-operative instead of from one of its customers.

Commissioner Joseph M. Donnelly said, however, the co-operative's charter specifically designated the commission as arbiter of rate disputes. The co-operative contends the wholesale rate demanded by the company is excessive.

•

Bill Would Suspend Agency

A bill has been introduced in the New York Assembly providing for suspension of further operations of the New York State Power Authority pending ratification of the St. Lawrence development treaty with Canada.

Meetings

American Society for Testing Materials—Regional meeting, Seneca Hotel, Rochester, N. Y., March 9. Committee Week, Seneca Hotel, Rochester, March 7-11. R. E. Hess, assistant secretary, 260 South Broad St., Philadelphia, Pa.

Northwest Electric Light and Power Association—Annual conference, business development section, Medford, Ore., March 16-18. Annual meeting, engineering and operation section, Vancouver, B. C., April 20-23. Berkeley Snow, executive secretary, 707 Spaulding Bldg., Portland, Ore..

Missouri Valley Electric Association—Sales and rural service conference, Kansas City, Mo., March 17-18. Engineering conference, Omaha, Neb., April 7-8. I. D. Pettigrew, assistant director, 1527 Sharp Building, Lincoln, Neb.

Oklahoma Utilities Association—Annual meeting, Biltmore Hotel, Oklahoma City, Okla., March 21-22. Kate A. Niblack, acting secretary, Oklahoma Utilities Association, 625-626 Biltmore Hotel, Oklahoma City.

Edison Electric Institute—Sales committee, Edgewater Beach Hotel, Chicago, Ill., March 28-31. Bernard F. Weadock, managing director, 420 Lexington Avenue, New York, N. Y.

Midwest Power Conference—La Salle Hotel, Chicago, Ill., April 13-15. L. E. Grinter, Dean, Graduate Division, Armour Institute of Technology, Chicago, Ill.

Greater New York Safety Council—Annual convention, Hotel Astor, New York, April 19-21. Julien H. Harvey, executive vice-president, 60 East 42nd Street, New York, N. Y.

Missouri Association of Public Utilities—Annual convention, Jefferson Hotel, St. Louis, Mo., April 20-22. Jesse Blythe, assistant secretary, Merchants Bank Bldg., Jefferson City, Mo.

Southeastern Electric Exchange—Annual conference, Edgewater Gulf Hotel, Biloxi, Miss., April 21-23. John Talley, executive secretary, 308 Haas-Howell Building, Atlanta, Ga.

Electrochemical Society—Spring meeting, Savannah, Ga., April 27-30. Dr. Colin G. Fink, secretary, Columbia University, New York, N. Y.

Association of Iron and Steel Engineers—Annual spring conference, Baltimore, Md., April 28-29. Brent Wiley, managing director, Empire Building, Pittsburgh, Pa.

A. W. Dater, Utility Official, 65, Dies

Alfred W. Dater, vice-chairman of the board of the Connecticut Power Company and chairman of the Stamford Gas & Electric divisional committee of the company, died at his home in Stamford February 21, in his sixty-sixth year. Mr. Dater, who was identified with the Stamford properties for 35 years in various executive capacities, was named to the board of the Connecticut Power Company in June, 1936, when the Stamford company became an affiliate.

A graduate of Yale University, Mr. Dater was connected with the Pennsylvania Railroad shops in Fort Wayne, Ind., before he entered the utility industry as assistant general superintendent of the Kings County Electric Light & Power Company, Brooklyn, N. Y., in 1897. He remained with the Brooklyn properties until 1903, when he resigned to go to Stamford. He became associated with the Stamford Gas & Electric Company as treasurer and then was made vice-president and general manager before becoming president, an office he held for 21 years until the merger.

•

Delaware School Students Strike Over Power Issue

When the Board of Education of Seaford, Del., sought to arbitrate its public utility demands 150 of the 325 high school students went on strike last week. The students wanted the board to patronize the Seaford Light & Power Company, which, town officials declare, Seaford eventually hopes to own.

Reinstatement of William F. Longendyke, who insists upon continuing as a customer of the Eastern Shore Public Service, was also demanded. The Seaford Town Council has ordered Eastern Shore Public Service to remove its poles and equipment from the town.

•

Expands Lighting Activities

Having been granted a license by the General Electric Vapor Lamp Company for the application of low-pressure mercury tubes to commercial lighting, Barkon-Frink Tube Corporation, 23-10 Bridge Plaza South, Long Island City, N. Y., offers designing, engineering and manufacturing service for all types of modern gaseous tube illumination. Ewart C. Hugh has been appointed vice-president in charge of sales of the commercial lighting division.

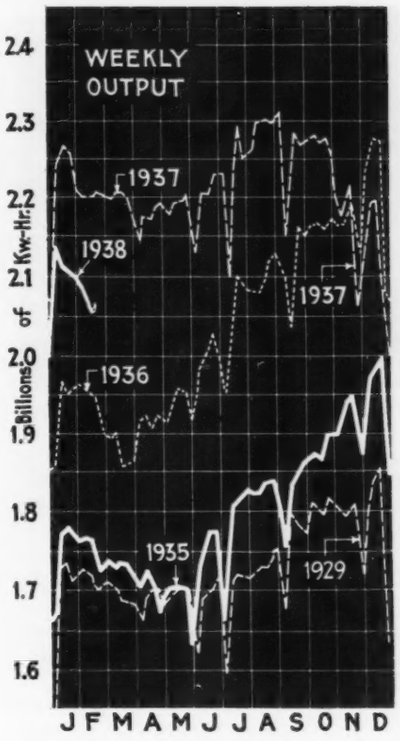
Output Rises Slightly

Energy production continues below 1937 but above all other years—Midwest is still the low region

Rising slightly compared with the preceding week, the output of the electric light and power industry during the week ended February 19 totaled 2,059,165,000 kw.-hr., according to the Edison Electric Institute. It fell short of the production a year ago by 6.9 per cent, the largest disparity thus far in the present period of reduced operations.

Compared with 1936 there was a gain of 109,000,000 kw.-hr., which indicates a moderate improvement over the week of February 12, when the increase was about 100,000,000 kw.-hr. The rise, though small, marked the first up-turn from the sharp downward trend in effect since the early part of January.

As in other recent weeks every section of the country registered less output than a year ago. The low area continues to be the Central Industrial region, down 13.8 per cent, as against 13.4 per cent a week ago and smaller disparities previously. New England's 10.3 per cent was a slight improvement. The West Central was nearly up to the 1937 figure.



Per Cent Change from Previous Year

Region	Week Ending Feb. 19	Feb. 12	Feb. 5
New England	−10.3	−11.3	−11.5
Middle Atlantic	− 2.1	− 2.4	− 1.4
Central Industrial	−13.8	−13.4	−11.3
West Central	− 0.2	− 1.9	− 2.7
Southern States	− 3.9	− 4.0	− 0.4
Rocky Mountain	− 8.7	− 7.4	− 1.4
Pacific	− 1.6	− 3.6	− 1.3
United States	− 6.9	− 6.7	− 5.4

Weekly Output, Millions of Kw.-Hr.

1938	1937	1936
Feb. 19 . 2,059	Feb. 20 . . 2,212	Feb. 14 . . . 1,950
Feb. 12 . . 2,052	Feb. 13 . . . 2,200	Feb. 7 . . . 1,952
Feb. 5 . . 2,082	Feb. 6 . . . 2,201	Feb. 1 . . . 1,963
Jan. 29 . . 2,099	Jan. 30 . . . 2,215	Jan. 25 . . . 1,956
Jan. 22 . . 2,109	Jan. 23 . . . 2,257	Jan. 18 . . . 1,950
Jan. 15 . . 2,115	Jan. 16 . . . 2,264	Jan. 11 . . . 1,971
Jan. 8 . . 2,140	Jan. 9 . . . 2,244	Jan. 4 . . . 1,855

Nebraska Power Sponsors Toaster and Iron Campaign

Sales quotas of 1,500 automatic irons and 750 toasters have been set for the nine weeks' co-operative sales campaign sponsored by the Nebraska Power Company and six local jobbers, to end March 31.

Dealers may allow $1 credit for an old toaster on purchase at standard prices of an automatic toaster and 50 cents credit on purchase of a non-automatic toaster. Similarly, old irons will be redeemed at $1 each on the purchase of new automatic irons at standard prices.

•

Hits Bonneville Cost Plan

Representative Plumley of Vermont has charged the Federal Power Commission with discriminating against the Boulder project in fixing low interest rates on amortization charges at the Bonneville project in the Pacific Northwest. He wrote the House appropriations committee that he would oppose further appropriations for Bonneville until the commission made some readjustment.

•

Skagit Franchise Rejected

Renton, Wash., city council by a unanimous vote has rejected the application of Seattle "City Light" for a franchise through the town for the Skagit transmission lines. The city of Seattle had offered $47,000 for the right. Steps to condemn property for a different right-of-way, which instead of going directly through Renton, will circle the town on three sides, just outside the corporate limits, are being taken.

•

Adds to Seattle Budget

Seattle city council has passed a resolution adding $771,602 to the city's fund for construction of Ruby Dam, transmission lines from the dam to Seattle and a south Seattle substation. The addition makes the city's share of the construction budget $7,956,602. PWA has allotted $3,000,000. The city's additional funds were made necessary by increase in cost of labor and materials, City Light executives told the council.

•

Connecticut Utilities Report Higher Annual Power Sales

First returns to be received for ELECTRICAL WORLD'S annual 100,000,000 kw.-hr. Supplement came from the Hartford Electric Light Company and the Connecticut Power Company. Both companies increased their operations above the 1936 level.

Connecticut Power, with a total output during 1937 of 312,501,944 kw.-hr. generated and purchased, shows an increase of 12.5 per cent over 1936. The Hartford company's reported output of 424,015,650 kw.-hr. seems at first glance to indicate a decrease of about 52,000,000 kw.-hr., but this is more than accounted for by a reduction of 78,000,000 kw.-hr. of intercompany sales. Sales to ultimate consumers amounted to 244,357,945 kw.-hr., or 12.5 per cent more than in 1936.

•

Expect Big Appliance Year

British Columbia Electric Railway Company estimates that sales of electrical appliances during 1938 in its own stores will amount to $700,000 and those by electrical dealers in Vancouver and adjacent territory will total $1,586,400. The quota for sales by electrical retailers is made up of the following units: 2,215 ranges, 1,950 refrigerators, 8,400 radios, 3,500 washers and ironers and 1,615 vacuum cleaners.

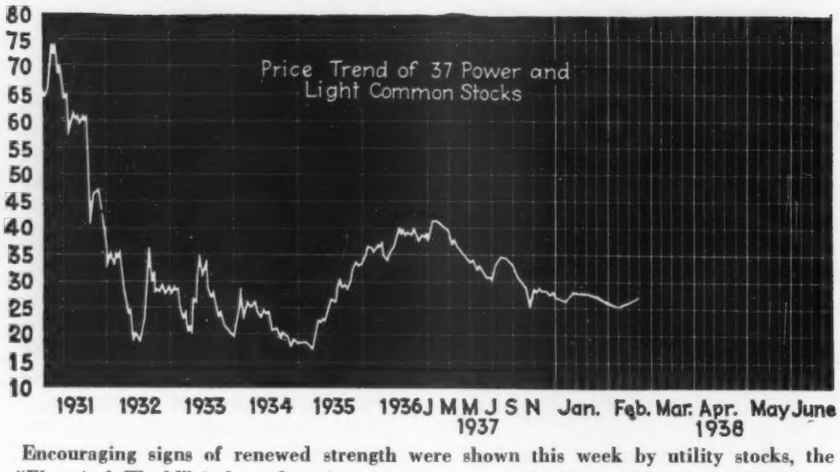
W. C. Mainwaring, general sales manager, presented the details of the quota at a recent meeting of electrical retailers and contractors held under the auspices of the British Columbia utility. Rural electrification is expected to provide 1,000 new customers in 1938, creating a new market for appliances valued at $250,000.

•

Seeks to Regain Plant

City officials of Humboldt, Tenn., have instructed a committee to open negotiations with executives of the West Tennessee Power & Light Company, lessee of the local power plant, for reclaiming the local system. Lessee officials have indicated they will consider an offer in relinquishing their contract with Humboldt, which has been in effect since 1925.

Stocks Show Renewed Strength



Encouraging signs of renewed strength were shown this week by utility stocks, the "Electrical World" index advancing 0.3 point to regain the position it held the first of the month. Index this week, 25.7; previous week, 25.4; year ago, 38.9

Utility Gets Title to Pledged Stock

SEC has approved an application by Middle West Corporation, successor to Middle West Utilities Company, to acquire legal title to 280,269 common shares of the Central and Southwest Utilities Company and 36,077 common shares of the North American Light & Power Company.

Application was based on incidents occurring in 1931, when Middle West Utilities lent stock of the Commonwealth Edison Company, Public Service Corporation of Northern Illinois and Peoples Gas Light & Coke Company to Insull Utility Investments, Inc., and the Corporation Securities Company of Chicago, with a right of hypothecation, receiving as pledge for the stock lent to the holding company securities to which the Middle West Corporation now will take title.

Immediately after the two investment companies received the securities loaned to them by Middle West Utilities these securities were pledged with a group of New York and Chicago banks for bank loans.

Middle West Corporation, the commission found, under the circumstances "has little choice but to acquire the legal title to the securities which it holds as collateral, as it is only by doing that it will be able to recoup some of the losses suffered."

•

Back Dividends Suit Filed

Cancellation of $1,616,023 of promissory notes assertedly held as a liability against Birmingham Electric Company by National Power & Light Company, of which Birmingham is a subsidiary, was asked in a stockholder's suit filed recently in Birmingham Circuit Court. The suit charges failure to keep an agreement whereby the notes were to be canceled as part settlement of a 1934 suit that sought recovery of some $5,000,000 claimed to have been wrongfully paid by Birmingham Electric to the holding company.

Primary purpose of the litigation, attorney for the plaintiff stated, is to bring about payment of delinquent dividends due Birmingham Electric preferred-stock holders. Preferred dividends totaling $175,000 are past due, the suit states.

•

Utah Power to Pay Arrears

Directors of the Utah Power & Light Company have declared a divident of $1 a share against accumulations on the $6 preferred stock, leaving arrears of $21.50 on the issue. Recent declaration of $1.16 2/3 on the $7 preferred stock leaves arrears of $25.08 a share. In December similar disbursements were made by the company on both classes of preferred stock.

•

Orders Utility Write-Off

Queens Borough Gas & Electric Company, subsidiary of Long Island Lighting Company, has been ordered by the New York Public Service Commission to write off its books $3,744,220, which amount it paid in excess of the book value of stocks acquired in 1927. By a three-to-two vote, the commission determined this excess payment was made when the Queens Borough unit bought the outstanding capital stocks of Nassau & Suffolk Light Company and Long Beach Gas Company, Ltd.

•

Beauharnois Power to Omit Interest on Collateral 5s

Beauharnois Power Corporation will not pay the interest on April 1 on its 5 per cent collateral trust bonds, John S. Norris, president, announced at the recent annual meeting of the company. He said that no funds are available for that purpose. When the arrangement was made with the bondholders in 1933, Mr. Norris pointed out, the Ontario hydro contract was still in effect. "Since that time," he said, "the contract was set aside and the company had lost about $7,000,000 of income."

A committee of the bondholders is engaged in working out some solution, and Mr. Norris said be believed the creditors would hear from the committee before April 1. Beauharnois is now delivering 125,000 hp. to the Ontario commission on the modified basis of the new contract which ultimately calls for 250,000 hp.

•

Georgia Issue Authorized

Georgia Power Company has been authorized by the state Public Service Commission to issue and sell first and refunding mortgage bonds amounting to $9,090,000, the bonds to draw 5 per cent interest and to sell for not less than 90 per cent of par value. Of the proceeds, $3,780,000 is to be used in refunding an issue of mortgage bonds falling due this year, while the balance covers construction and increased service facilities already made or to be completed during 1938.

Earnings Reports (Utilities)

	Net Income 1938	1937
†The Detroit Edison and subs.....	$9,426,324	$10,672,096
	1937	1936
*Federal Lt. & Trac. and subs.....	1,689,154	1,634,139
*Wisconsin Pub. Serv. and sub.....	1,408,066	1,205,059
*New Jersey Power & Light	1,372,541	1,078,465
*Metropolitan Edison	3,294,825	3,572,746
*Oklahoma Gas & Electric	2,580,425	2,424,298
*Columbia Gas & Elec. and subs....	13,573,490	13,223,242
*Brooklyn Edison..	11,643,218	10,416,734
*Eastern Utilities Assoc.	1,723,846	1,958,360
*Southern Calif. Edison	12,136,162	12,760,559
*Pennsylvania Elec. and subs.....	1,685,779	1,485,367

*Twelve months ended December 31.
†Twelve months ended January 31.

Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

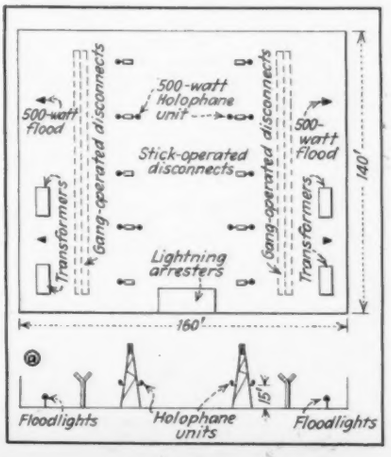
Switchyard Lighting Helps Operators

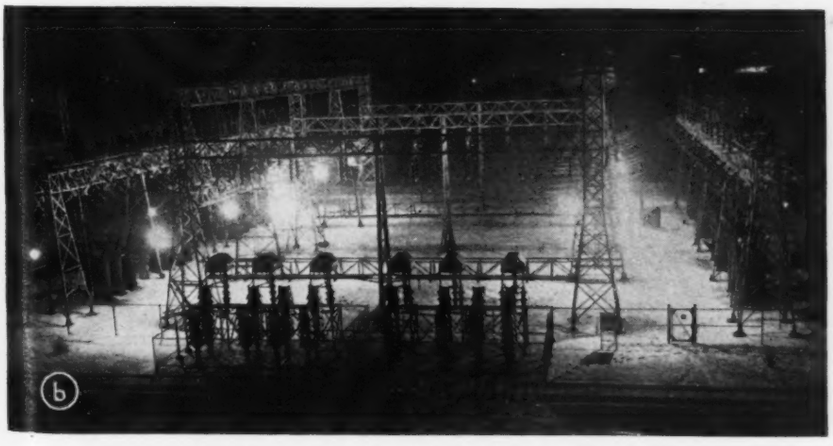
By R. A. POTTER
Northampton (Mass.) Electric Lighting Company

Due to the slow opening of the pupil of the eye, a plant operator going from a brightly lighted station interior into a dimly lighted switchyard faces quite a considerable visual handicap. To overcome this handicap at the Harriman generating plant of the New England Power Company the lighting installation of the 110-kv. yard has recently been modernized. The old layout involved the use of several 200-watt, wide-beam clear-lens floodlights mounted on 4-ft. pedestals. This gave a fair illumination, but progress in lighting methods and equipment enabled the yard to be greatly improved, as indicated in the accompanying illustrations, by the use of 500-watt Westinghouse "CAG-14" floodlights with rectilinear spread lenses on the former mountings at the ends of the yard and for the other sections Holophane 500-watt substation lighting units No. 043384.

Each floodlight produces a broad flat band of bright light on the disconnecting switch blades, the band being wide enough to cover one circuit. The floodlights are also available for concentrating light on any part of the steel structure when emergency repairs must be made. The lights were installed so as to bring the most intensive illumination on the points of closure of both gang- and stick-operated disconnects. In this yard we were fortunate in having the correct mounting heights of the units come in such a way that no pipe had to be cut. The 10-ft. sections went together "slick as a whistle" and ended at the exact locations.

The new lighting overcomes the former relatively poor contrast the brown ring of a disconnect blade provides against the background of gray steel and black night. Better light also overcomes the handicap of size, acting as a magnifier of the ring on the blade and insuring faster picking up. Eye fatigue is reduced and after completing the outdoor operation the switchman goes cheerfully back to the station.





New lighting layout virtually "daylights" switching structure
(a) Layout of yard showing location of units. (b) Switchyard at night

•

Use Low-Cost Oven for Drying Bushings

For drying out high-voltage bushings before replacing them on the apparatus from which they had been removed in the transformer repair shop at the Page Avenue substation of the Union Electric Company of Missouri, St. Louis, a low-temperature oven was desired. All that was needed was a simple, fairly well-insulated inclosure, a few heating units and a temperature control device.

The inclosure was made of wood, lined with asbestos sheet. The heating units are a number of old street

car heaters connected for 220 volts instead of the 600 at which they were once used, and the temperature controller is a thermostat taken from the oven of an old electric range.

•

Trailer Unit Carries Tank, Filter Press

By C. F. EDWARDS
Assistant Superintendent of Substation Construction Westchester Lighting Company, Mount Vernon, N. Y.

A one-man, mobile, trailer-mounted tank and filter press unit capable not only of transporting 2,500 gal. of transil oil but of filtering this quantity of oil in two hours is used on the 560-square-mile system of the Westchester Lighting Company for routine and emergency oil purification.

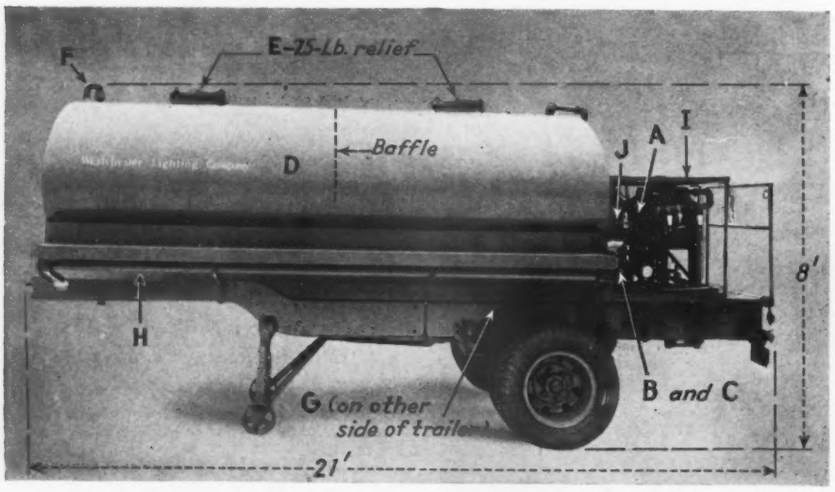
A remote-control arrangement, consisting of an automatic contactor on the a.c. pump motor with the usual cable and push-button arrangement, allows the pumping equipment to be started or stopped by a single operator at the point of oil removal or feed where the oil level can be observed. A detachable 5-ton tractor-truck that draws the tank and filter unit or "milk wagon" from point to point on the system is used at other times for general hauling work on other company trailers.

The piping system is so arranged that fluids can be passed into or out of the pump direct or into and out of the tank through the filter press or the pump may be used independently of either the tank or the press. All valves in the piping system are brass gate valves. A total of 300 ft. of 1½-in. "Goodyear" hose is used with the unit to reach remote locations.

Major equipment mounted on the trailer unit includes:

12-in. 12-compartment Schriver blotter press.
1,250-gal.-per-hour double eccentric pump.
1½-hp., single-phase, 110/220-volt reduction geared motor.
2,500-gal. oval-form single baffle oil tank.
Auxiliary equipment and accessories.

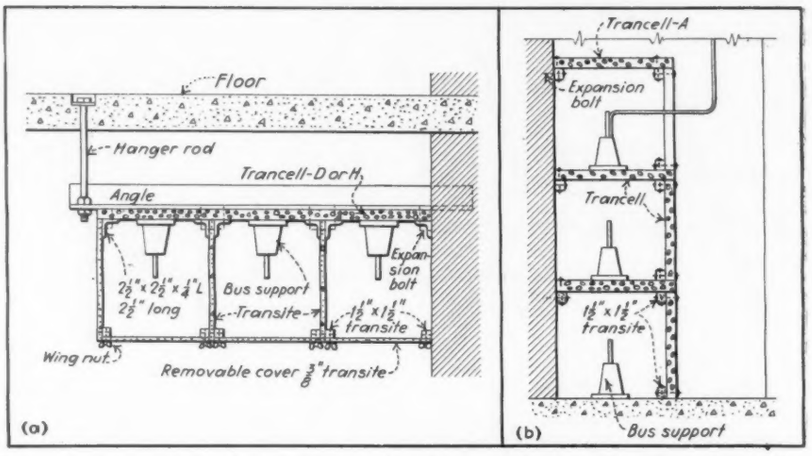
The general arrangement of the equipment on the trailer is shown.



Oil filtering and transport truck drawn by detachable general-purpose tractor unit serves suburban system

(a) Schriver blotter press.
(b) Double eccentric pump.
(c) Single-phase reduction geared motor.
(d) Oval form single-baffle tank.
(e) Hinge top manhole covers with 25-lb. relief valve to relieve air pressure on filling.
(f) Breather pipe.
(g) 6x6-in. cylindrical sump equipped with 1-in. drain valve also fitted with 1½-in. nipple for connecting outlet pipe.
(h) Eight pieces of Shelby steel tubing containing 13-ft. sections of 1½-in. canvas-covered oil hose. Drop gate over open end.
(i) Weatherproof housing for press and pump (removed).
(j) CO_2 fire extinguisher.

BUS INCLOSURE ARRANGEMENTS



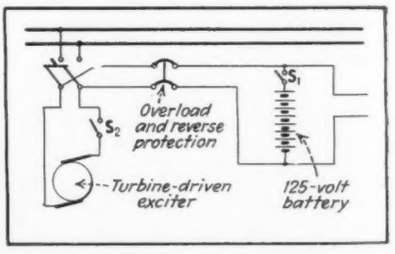
Two arrangements for inclosing buses in fire-resisting isolating cells suggested by Johns-Manville Inc. (a) Construction for overhead bus. (b) Inclosure for bus mounted on floor.

Battery Control for Emergency Use

By A. L. BENNETT
Hibbing, Minn.

With increasing loads many small plants are replacing old manually operated switchgear with solenoid-operated gear that is generally energized by 125-volt batteries.

In a local plant making such changes exciter equipment consisted of one motor-driven exciter and one steam-driven exciter that was necessary for starting. The storage battery was provided with a tungar charger that had a rating up to 5 amp., but it was generally operated at ½-amp. trickle charge.



Battery and exciter interconnected to allow either to substitute for the other in case of failure

Since occasions might arise when a heavier charge than 5 amp. would be desirable a connection with the steam exciter was discussed. Study showed, however, that an arrangement could be made that would accomplish the following:

1. Connect the steam exciter to the battery for rapid charging.
2. Connect the steam exciter to the

switch controls in case of battery failure.

3. Connect the battery to the exciter bus in case of failure of both motor and turbine-driven exciters.

The circuit arrangement is shown in the accompanying diagram. Separate voltmeters are provided so that the exciter can be adjusted to battery voltage conveniently. Overload and reverse current protection is provided, the latter to prevent the exciter being motored by the battery.

•

Report Experience With Petersen Coils

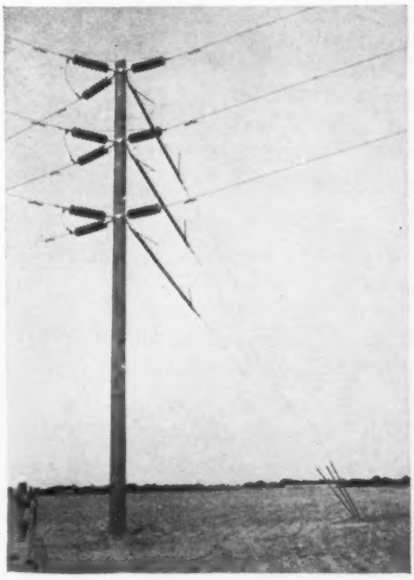
Experience so far gained with Petersen coils has been so satisfactory that this type of protection is becoming very popular in England, H. W. Taylor and P. F. Stritzel told the Institution of Electrical Engineers, in a recent London meeting. It is expected that Petersen coils will soon be in operation on more than 50 networks in the United Kingdom.

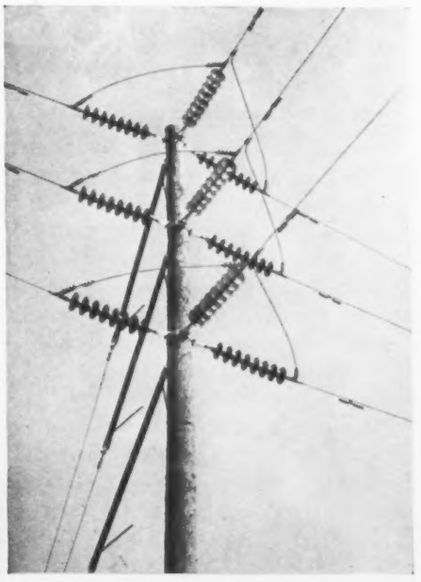
Edmonston Electricity Corporation installed its first 11-kv. experimental coil in 1934, followed two months later by another. The first year of operation showed that they reduced considerably the number of interruptions that can normally be expected to occur on such a network. One coil in Cornwall, where the network is subjected to bad salt-fog conditions, functioned 22 times in 1936 under severe fog or lightning conditions without a single interruption.

In another case a section of line had been shut down during a gale several times by an intermittent ground fault. It was then found possible to transfer this section to a network which is protected by a Petersen coil. Thereafter for the rest of the storm, which lasted several hours, the section of line remained in service, although the recording ammeter indicated that the fault occurred a further twelve times. Following is the operating record for 1935 on the Edmonston system:

	Andover	Braintree
Total faults recorded	41	20
Phase-to-phase faults	14	3
Ground faults	27	17
Number of interruptions	16	3
Number of interruptions prevented	25	17
Percentage of ground faults cleared without interruption	93	100

ONE POLE, ONE ANCHOR FOR 66-KV. STRUCTURE





When right-of-way restrictions allowed only one pole and one anchor to be used in the T-structure where a branch feeder to Cyril, Okla., joined the 66-kv. trunk between Lawton and Chickasha the Southwestern Light & Power Company adopted the arrangement shown in the accompanying illustration. Three guys were needed to offset the 5,000-lb. ultimate tension on each conductor and were all connected to the oversize deadman, details of which

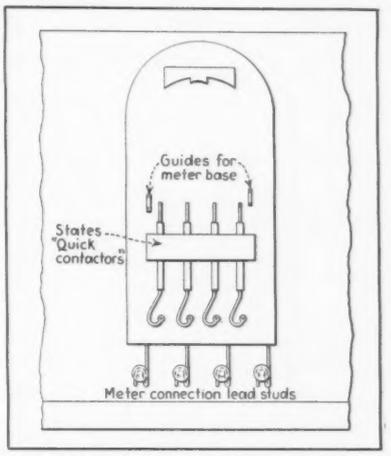
are shown. Sections from a discarded pole were bound together with pole bands to form the anchor.

Removable Adapter Speeds Meter Check

By EARL L. HURT

Meter Department, Public Service Company of Northern Illinois

In meter testing laboratories, where normal operation covers a wide variety of meter types, kinds and makes, it is advisable that testing facilities be not too much specialized



Faster testing of "A" meters with this adapter

so that all facilities may be kept employed. However, in such laboratories there do come times when a run of a particular type will occur. Then the value of special equipment will become quickly apparent and the lack of it be felt.

To retain the versatility of the all-meter type of test board and as well to realize the advantage of the special board when the need for it arises a test board adapter was devised for "A" type meters and is in use in the meter laboratory of the northern division of the Public Service Company of Northern Illinois. This adapter consists of a wood panel which can readily be set up on any of the test boards and on the face of which are holding and connection facilities.

As is shown in the accompanying sketch, four inverted hooks of heavy copper wire extend downward from the adapter, properly spaced to rest on the binding posts of the test board. The adapter is held in place behind by the stud from which a meter under test would hang on the board. When the "A" meters awaiting test accumulate in more than normal proportion, it becomes worth while to set up the adapter and run them through at the higher production speed thus afforded.

Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

Accident Influences Mill Modernization

By W. C. WARNER
Consolidated Gas, Electric Light & Power Company of Baltimore

Breakdown of a steam power plant putting a decisive stop to operations at the Hirshberg Paint Company paved the way for revamping of equipment and methods which has increased efficiency, given greater manufacturing flexibility and contributed substantially to more economical and uniform production.

Emergency installation of temporary motors on line shafting restores factory to operation after breakdown and during installation of permanent individual and group drives

For several years this firm had considered the installation of central station service, attracted by the possibilities which it offered. The entire factory had been operated from a 100-hp. steam engine which drove line shafting on two floors as well as some printing machinery on the third floor. Since electrified operation called for extensive changes throughout the factory the matter of an improved power supply was postponed. It was revived promptly, however, when the engine blew out a cylinder head during the summer of 1937.

Fortunately the accident occurred during a slack manufacturing season. The owners chose this as an opportune time to inaugurate improvements that would produce continuing benefits. Local power sales engineers surveying the factory decided that the line shaft drives should be temporarily retained, with a 30- and a 40-hp. motor installed to handle the work formerly done by the engine. This would permit production schedules to be maintained while the necessary permanent wiring was being installed for individual and group drives throughout the factory.

Work was immediately got under way with the permanent wiring and motor layout. On the first floor a battery of six paint mills was segregated with a group drive operated by a 25-hp. motor. A battery of pigment grinders constituted a second group drive on this floor and a third was installed to care for a section of mixers. Individual motors were installed on a large putty chaser (10 hp.) and on each of two elevators. On the second floor a 15-hp. motor was installed to drive two large agitators and six small mixers. The other mixers were divided into three groups, each having its own motor. A small motor replaced a steam turbine on a centrifugal paint clarifier. In all, fourteen motors, ranging in size from 1 to 25 hp., totaling 125 hp., superseded the steam engine.

In commenting on the benefits effected by the changeover, Mr. Hirshberg, president of the company, said:

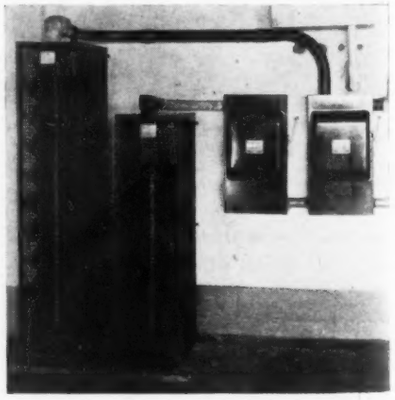
> The modern, flexible arrangement has enabled us to increase our output and to operate more efficiently. It avoids the waste of power, when only a few machines are being run, which was formerly involved in using the engine since it permits independent operation of any part of the factory. We find this an economy feature as well as a decided improvement from the standpoint of convenience.

•

Boost Power Factor to Save Investment

By LEE C. SHELAIN
Power Engineer, Central Illinois Electric & Gas Company, Rockford, Ill.

Increased load and poor power factor in the plant of a manufacturer of turbine and engine governors was overloading the plant's main line breaker and causing it to run hot. An investment of approxi-



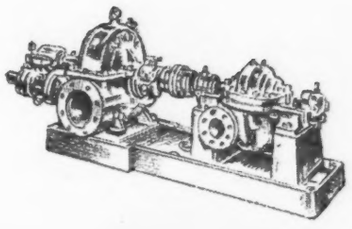
Capacitor installation earns 46% return in first year

an Announcement . . .

THE INTEREST which the Worthington Pump and Machinery Corporation has acquired in the Moore Steam Turbine Corporation of Wellsville, New York, adds to the list of products sponsored by Worthington, a line of steam turbine equipment second to none. We propose to provide Moore Steam Turbine Corporation with the benefit of our engineering resources, in matters pertaining both to application and metallurgy, so as to employ fully the expanded manufacturing facilities recently completed at the Moore Plant in Wellsville, New York.

It is the determination of both the Moore and the Worthington organizations to continue the steady progress of development which has characterized the policy of the Moore Steam Turbine Corporation throughout its existence. The fine reputation which Moore products enjoy in many industries, including Petroleum, Chemical, Public Utility and Shipbuilding, is based upon a standard of quality which will be maintained.

Vice-President



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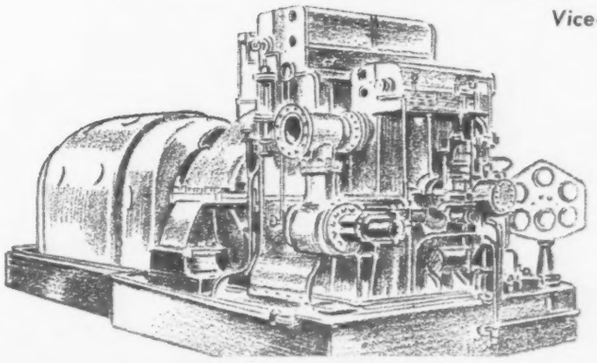

THE history of every company that has become associated with Worthington has been one of wider engineering understanding, expanded research facilities and access to broader markets. These associations have developed the ability of each to better serve its patrons. New friendships have been formed with the addition of each new unit . . . and more enterprises have learned to depend upon Worthington for a greater range of products.

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mately $300 for a larger breaker and new cables threatened until 75 kva. of capacitors was installed, reducing the main line current below the rating of the breaker and permitting it to operate at normal temperature.

Prior to the installation of capacitors the average monthly power factor had been 52 to 56 per cent. Monthly maximum fifteen-minute demand was 90 kw. and annual power consumption was 220,000 kw.-hr. After correction the plant average power factor was 91 to 93 per cent. The annual saving in power cost showed a return of 46 per cent on the investment.

Installation of the 75 kva. in capacitors was made in two units of 45 and 30 kva. Each unit served an individual floor where the load was heaviest. Separate units were installed to provide flexibility as to correction needed, hours of operation and power required. Units were connected to feeder distribution cabinets to allow advantage to be taken of additional feeder capacity created by capcitors from the main power panel.

•

Profits Accompany Purchased Service

By R. C. GRIMSTAD
Industrial Power Sales, Duquesne Light Company

Annual savings in power cost amounting to $1,360 incident to abandonment of isolated plant operation have been realized by a Pittsburgh machinery manufacturer, whose change to purchased electric service has also made it possible to release 680 sq.ft. of valuable shop space for production.

Due to war conditions, when this plant was built in 1916 two internal combustion engines using natural gas were installed to supply power requirements. These engines were connected to d.c. generators of 80 and 85 kw. capacity. Purchased power was used only for standby lighting and for a few small motors on the heating system.

Inability of this isolated plant to handle the power requirements anticipated by the company made inevitable a large investment for reconditioning the equipment and installation of additional generating capacity.

In the course of a careful study

Motor-generator set occupying 40 sq. ft. displaces two engine generators occupying 720 sq.ft. and saves $1,360 in power cost

of this company's power problem by the local power salesman an estimate of the cost of purchased power was made upon the basis of the customer's operation at the time. From these data the cost comparison between isolated plant operation and purchased service given in the following table was made; the savings indicated have been fully realized by this company after about a year's operation:

	Iso'ated Plant	Purchased Power
Labor	$1,431.16	.....
Gas	2,124.00	.....
Oil	314.60	.....
Purchased electricity	1,030.32	$4,195.00
Repairs, maintenance and supplies	784.00	125.00
	$5,684.08	$4,320.00

In making the change to purchased power it was impossible to shut down the shop. The change had to be made gradually. Load on the engine plant was first reduced by installing an a.c. motor on a line shaft. This allowed normal operation to continue with increased production. All of the remaining individual motors were continued on d.c. operation to permit speed control. A plan was devised for serving this d.c. load with one of the existing generators direct connected to a synchronous motor. Due to previously mentioned limitation of the d.c. load one d.c. generator proved adequate for the entire remaining direct-current load. However, a spare motor-generator set will be installed in the near future.

Due to improved business conditions during the past year this shop's use of service has been about 80 per cent above the estimate based on earlier conditions. The manufacturer states that the past year's production would hardly have been possible with the old equipment. Under present conditions the cost of the change will be paid for from savings in about two years.

Tilt Switches Keep Huge Shovel Level

Automatic leveling achieved by an arrangement of four small mercury tilt switches on a plane table keeps level the entire structure of the world's largest electric shovel used by the Binkley Coal Company of Missouri for strip coal mining. By thus doing away with the need for swinging the machine when it is out of level considerable savings in power consumption are realized. The machine, made by Bucyrus-Erie, weighs 1,250 tons.

Any tendency of the machine to settle tilts the plane table on which the mercury switches are mounted and causes the mercury to flow from one end of the switch tube to the other, completing a circuit. This circuit actuates the motors of independent, high-pressure pumps con-

Leveling device reduces power consumption of stripping shovel

Tilt tubes (insert) at the corners of a plane table operate hydraulic jacks that level this 1,250-ton stripping shovel. The shovel is powered by 32 motors totaling 2,400 hp. and has a dipper capacity of 33 cu.yd.

nected to each of several hydraulic leveling jacks which return the huge stripper to level, releveling the control table with it and returning the mercury switch to open-circuit position. Each switch acts through relays to control completely the interlocking electrical devices and fluid valves.

Automatic leveling in addition to effecting considerable saving in power consumption is said to reduce delays by eliminating interruptions in the digging cycle.

A NEW SLANT

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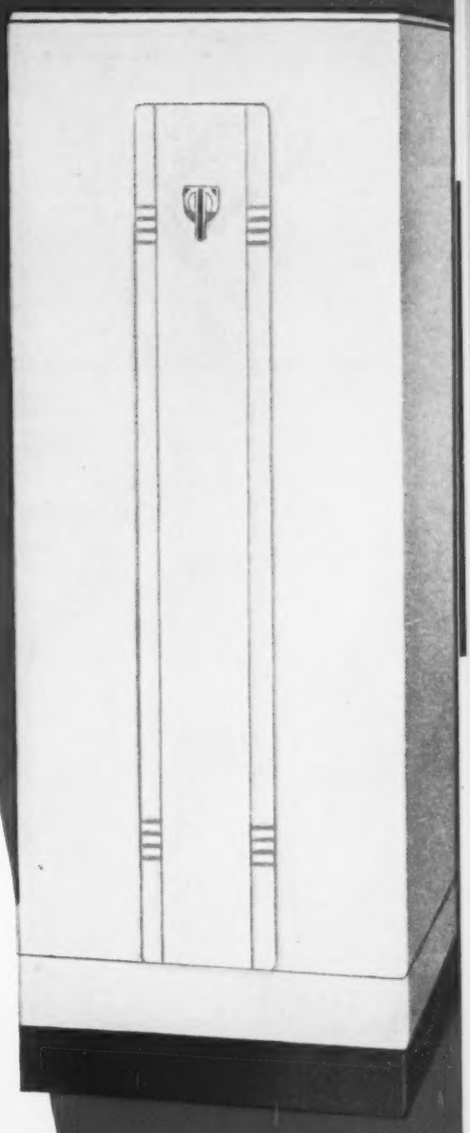
NOW REAL HOT WATER SERVICE *HOME-PROVED*

EASY QUICK CHEAP

JUST LIKE ELECTRIC LIGHT!



The home is where the water heater is used. And from the home comes sales-making proof of Westinghouse performance! Typical American families checked cost, performance, convenience . . . in their own homes. Now certified reports provide a profit-building selling story: *Home-proof* that Westinghouse Water Heaters give real hot water service — easy, quick, cheap — just like electric light!

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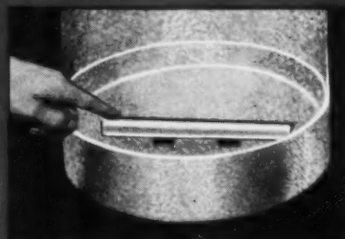
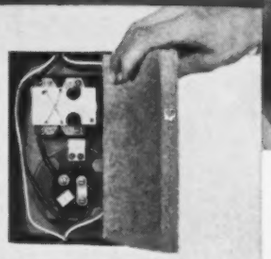


Scientific baffle keeps inrushing cold water at bottom of tank, prevents it from cooling water already heated.

Exclusive Corox Units transfer every bit of heat directly into the water — heat more water for less money.



Superaccurate thermostats turn electricity on when water is cool; off when it's hot. Save money, end work and worry.

Extra-thick Palco Wool insulation keeps water hot for longe periods while no electricity i used. Cuts water heating costs

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Westinghouse *Home-proved* Water Heaters

EVERY HOUSE NEEDS WESTINGHOUS

New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

Polyphase Motor Has Wide Speed Range

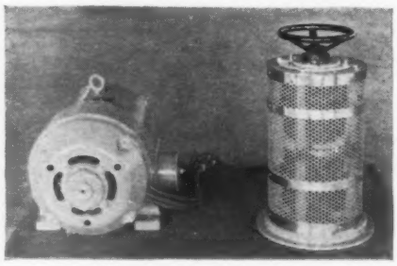
By M. C. SPENCER
Crocker-Wheeler Electric & Manufacturing Company, Ampere, N. J.

A six-pole, 60-cycle, polyphase induction motor having characteristics similar to a direct-current motor and providing continuous speed adjustment over a range from zero to about 50 per cent above synchronous speed has been developed by the Crocker-Wheeler Electric & Manufacturing Company. Speed of this motor may be adjusted without breaking the circuit or introducing rheostat losses. Substantially constant torque is developed over its entire speed range. Power factor of the motor may also be adjusted over a considerable range.

Known as the "polyspeed," this motor is provided with a winding similar to a three-phase induction motor stator winding and an induction type regulator, both connected directly to the line. The rotor has a single winding similar to a normal d.c. armature winding connected to a commutator in the usual way. Three brush groups are provided per pair of poles. The induction speed regulator acts on the rotor circuit.

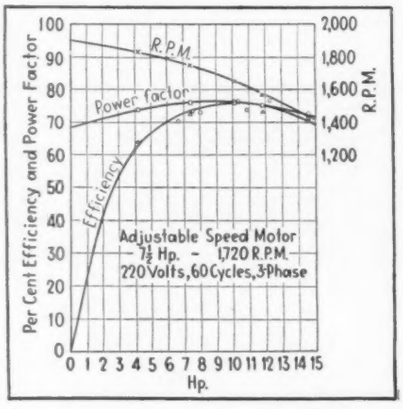
Speed of the motor depends upon the voltage applied to the brushes. At standstill, maximum current would circulate in the rotor circuit if short-circuited, thus bringing the rotor to speed quickly. Instead, in the "polyspeed" motor, a three-phase voltage exactly equal and opposite to the rotor-generated voltage can be applied to the brushes at standstill from the two open delta-connected induction regulators. Under this condition no current will flow in the rotor and it will remain stationary. By adjusting the voltage regulator the bucking voltage can be gradually reduced and the consequent rotor current will cause the rotor to turn. Also by adjusting the bucking voltage while running, the motor can be made to run at any constant speed from zero to synchronous speed. By reversing the three-phase voltage applied to the motor brushes an aiding voltage is applied to the brushes and the motor will run up through synchronous speed to higher speeds.

The speed regulator consists of two single-phase, induction type voltage regulators on a single shaft with their primary windings located on the rotors. The requisite bucking voltage of decreasing value is obtained from the secondary by turning the rotor from 0-90 deg. and an aiding voltage of increasing value (for over synchronous speeds) is ob-

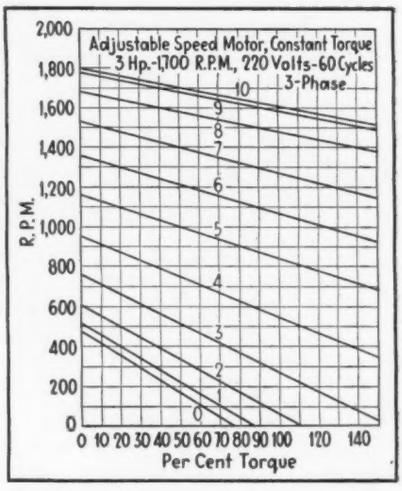


Continuous speed adjustment from zero to about 50 per cent above synchronous speed provided by new motor

Develop full load starting torque with little more than full load current. Starting torques of three to four hundred per cent full load are available. Present sizes limited to 7½ hp. and below, rated on the basis of top speed.



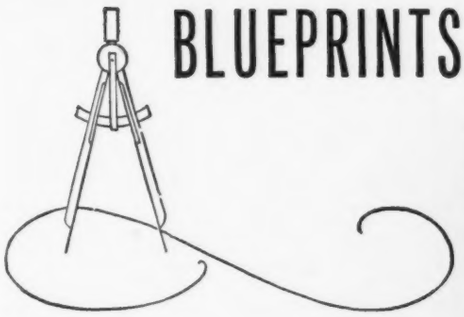
Speed, power factor and efficiency curves for "polyspeed" motor



Speed regulation at the ten regulator settings

These two sets of curves are not for the same motor. Note that the drop in speed with load is similar to d.c. motor. As speed is reduced the drop in speed with load increases. With sufficient increase in bucking voltage the motor will stand still under full load torque. At no load and this setting speed will rise to 400-500 r.p.m. This characteristic is similar to d.c. motor on the Ward Leonard system. At these low speeds the drop in voltage due to armature resistance becomes large with respect to the working voltage and the per cent regulation becomes poorer. This is characteristic of both this type motor and the d.c. motor on the Ward Leonard system.

BLUEPRINTS FROM A SPECIAL HANDBOOK



BRANCH CIRCUIT OR SWITCH LEAD INSTALLATION

featuring

CON-NEC-TAP CLAMPS

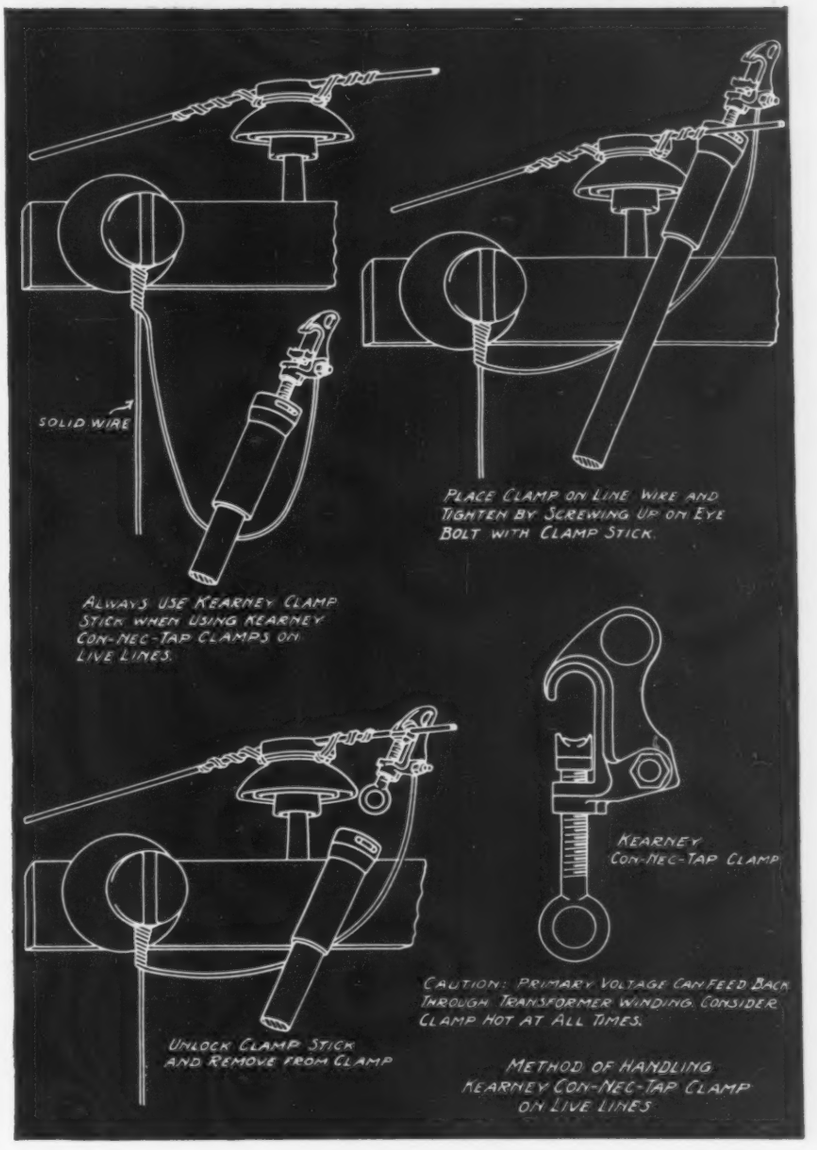
You can quickly and safely connect or disconnect branch circuits or switch leads from the main line with the arrangement, here shown, which specifies, you'll notice, use of Kearney Con-Nec-Tap Clamps.

This simple construction shows the riser or vertical wire attached to the crossarm, carrying the main line by means of an insulator mounted in a horizontal position adjacent to the main line insulator.

The Sure-Lok clampstick provides a safe and positive means of connecting or disconnecting taps or branch lines. Locking feature of the clampstick assures the lineman of positive control over the clamp and jumper during installation or removal.

If you are interested in this construction, you'll also be interested in the convenience and safety of Kearney Con-Nec-Tap Clamps. Write for information.

FREE — "Blueprints" of six previous constructions, bound in a pad, are yours for the asking.


SOLID WIRE
ALWAYS USE KEARNEY CLAMP STICK WHEN USING KEARNEY CON-NEC-TAP CLAMPS ON LIVE LINES.
PLACE CLAMP ON LINE WIRE AND TIGHTEN BY SCREWING UP ON EYE BOLT WITH CLAMP STICK.
KEARNEY CON-NEC-TAP CLAMP
CAUTION: PRIMARY VOLTAGE CAN FEED BACK THROUGH TRANSFORMER WINDING. CONSIDER CLAMP HOT AT ALL TIMES.
UNLOCK CLAMP STICK AND REMOVE FROM CLAMP
METHOD OF HANDLING KEARNEY CON-NEC-TAP CLAMP ON LIVE LINES

Twenty modern Kearney Con-Nec-Tap Clamps are available, including clamps for armor rod work, to handle, more conveniently, just about any requirement you come across. These clamps are constructed of proper materials for strength and are correctly threaded to prevent loose contacts from line vibration. Sample on request. Specify use.

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tained by turning the rotor from 90 to 180 deg.

Since the motor operates at constant field constant torque can be obtained over the entire speed range. At speeds below synchronous slip energy is returned to the line through the speed regulator and above synchronous speed a part of the energy for driving the motor is supplied through the regulator, directly to the rotor.

Power factor can be controlled by brush setting. Beyond an optimum setting improvement in power factor is obtained at a sacrifice of efficiency. Ordinarily brushes are set where maximum torque is obtained per ampere in the rotor. This is near the point of maximum efficiency.

•

Indicating Device Measures Phase Angle

By WALTER MIKELSON
General Engineering Laboratory,
General Electric Company,
Schenectady, N. Y.

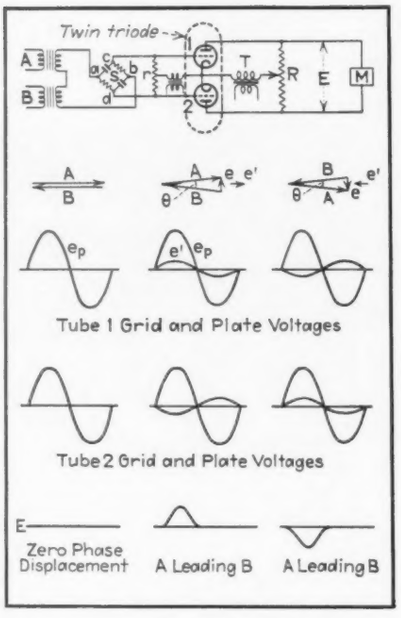
The problem of interconnecting independent distribution lines or feeding one transmission line from several sources has interested engineers in methods for determining phase-angle relationships along the line. This type of information is necessary in order to control independently the flow of power and reactive kva. and to prevent overload on the various lines.

The phase-angle meter described here has been designed to indicate small phase displacement from zero to plus or minus two degrees between voltages at any two points on such lines. The device is essentially two separate units: (1) A detector unit. (2) An indicating unit. The detector unit contains the electrical phase displacement detector circuit, described herein, while the indicating instrument is a zero center d.c. milliammeter supplied from the output of the detector unit. Output of the detector unit may be used also to operate a recorder or as the basis of automatic control of generation to satisfy tie line requirements.

The scheme utilizes the resultant voltage from the two out-of-phase sources, connected in series opposition, to supply the grids of a type 53 twin triode tube through a phase-shifting bridge. Plate currents of the tube actuate the indicating instrument. Secondaries of two grid transformers supplied from the two a.c. sources of constant amplitude A and B are connected in phase opposition so that when the two voltages are in phase their resultant is zero. When A and B are slightly out of phase, a voltage e appears across ab whose magnitude is proportional to the phase angle. For small angles of this voltage e can be considered to be 90 deg. out of phase with either A or B.

The phase shifting bridge S causes a voltage e' 90 deg. out of phase with e to appear across cd and across the grid resistor r and actuate the grids of tubes (1) and (2), which are connected in push pull. Voltages at the two grids therefore become 180 deg. out of phase with each other so that when the grid voltage of tube (1) is positive the grid voltage of tube (2) is negative, and *vice versa*. The *a-c* voltages at the plates, on the other hand, are in phase with each other. Thus when grid excitation occurs, the grid of one tube is driven in phase with the plate and the grid of the other tube is in opposite phase to the plate.

The d.c. indicating instrument M, having its zero at the center of the scale, is connected across the plates of the tubes. Current through one tube only deflects the meter in one direction, while current through the other tube only deflects it in the opposite direction.



Meter measures phase displacements up to two degrees

The twin triode tube used, although actually one tube, has the characteristics of two separate tubes. Therefore, to simplify explanation the separate elements have been referred to as tubes (1) and (2).

In operation with no signal on the grids, the unidirectional pulses of plate current through the tubes divide equally through the plate resistor R, so that zero resultant voltage appears across the d.c. indicating instrument M. When A and B are slightly out of phase a voltage e' will appear across the grids. Assume, for example, that the phase sequence of A and B is such that the plate and grid voltages of tube (2) are 180 deg. out of phase with each other. The plate current through tube (1) will then increase, while the plate current of tube (2) will decrease, resulting in a unidirectional pulsating voltage E. These pulses will produce a steady deflection of the indicating instrument M.

When A and B are out of phase with the opposite phase sequence the plate current through tube (2) will increase, causing a voltage $-E$ to appear across M.

Since the magnitude of e', for small angles of θ, is proportional to θ, the magnitude of E and hence the deflection of M is proportional to θ. The sign of E will depend on the phase sequence.

•

New Gas-Filled High-Voltage Cable

After six years of laboratory experiment and a great amount of development work, cable insulated with dry paper, filled with inert gas and covered with reinforced lead sheath is now said by A. N. Arman, *Journal* of the Institution of Electrical Engineers, London, to be ready for actual installation on voltages of 132 kv. and over. The following advantages are being claimed for this cable:

1. Gas, being compressible, makes it unnecessary to accommodate expansion except by providing an inclosing sheath of sufficient strength for the specific pressure. A cable constructed on this principle should remain entirely unaffected by heat cycles, provided the temperature does not become high enough to scorch the paper. Higher temperature rises with resultant higher carrying capacities can therefore be allowed.

2. The "tracking type" of failure is prevented, since no oil or compound is used.

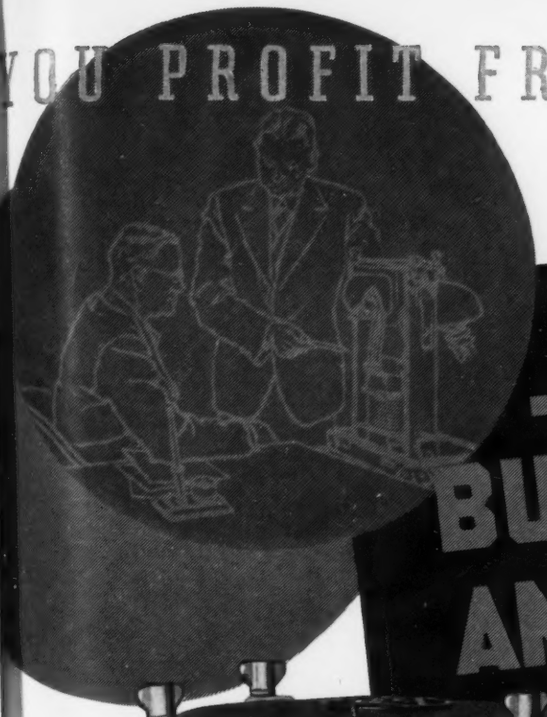
3. The manufacturing difficulties involved in the production of a void-free cable do not arise.

4. The charging currents for this type of cable are lower, because the permittivity of dry paper is lower than that of an impregnated dielectric.

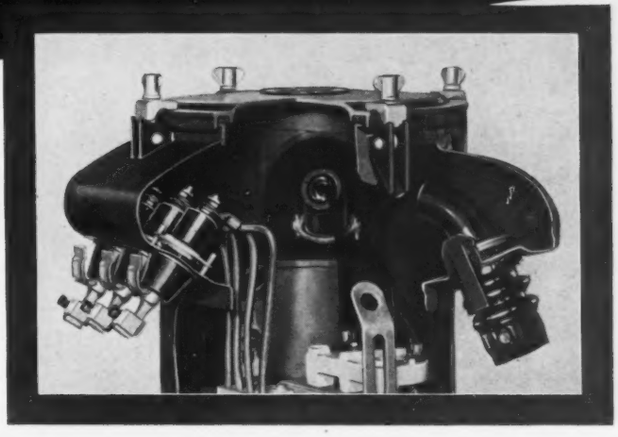
5. The dielectric losses are lower, because, in addition to the lower permittivity, the power factor of dry paper is also lower.

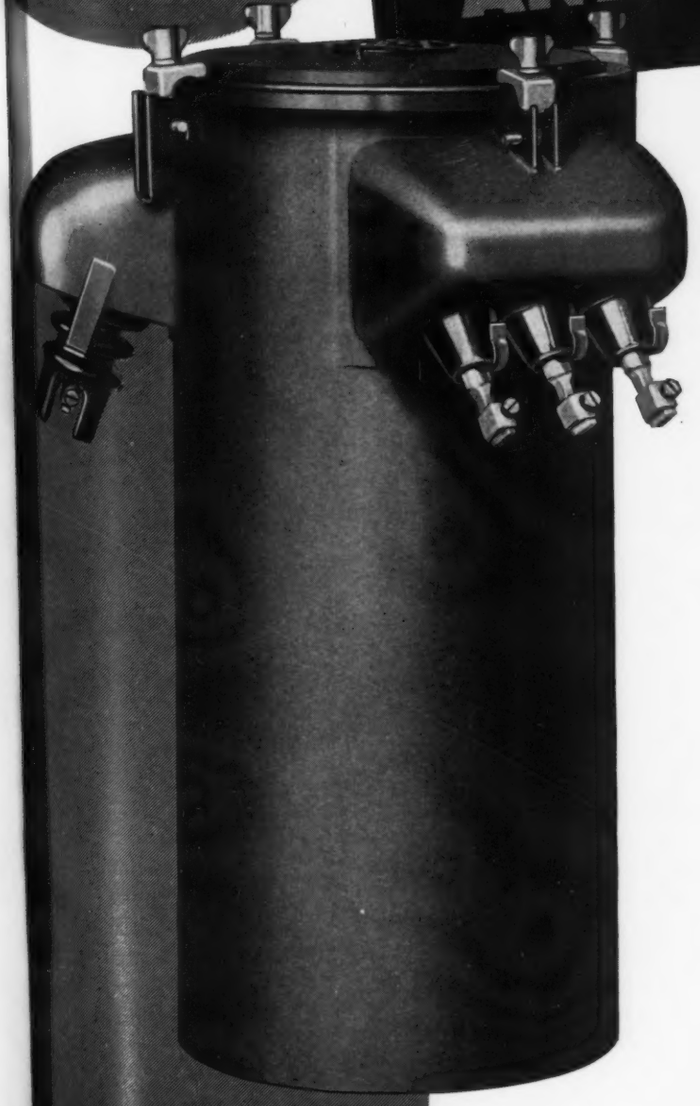
6. Gradients present no difficulty.

YOU PROFIT FROM THIS ADVANTAGE



ELIMINATE BUSHING BREAKAGE AND OIL LEAKAGE





Haul L-M Transformers out on the job, hoist them up a pole, or handle them in the storeroom—you will not run the chance of damaging a bushing. The big overhanging pocket gives maximum protection against bushing breakage.

Oil will not syphon out and run down the leads — the internal bushing construction and the gaskets take care of that. And those gaskets that keep the oil in and moisture out are protected from the weather.

This bushing design is another of the many advantages you will find in L-M Distribution Transformers. Ask your L-M Representative or write Line Material Company, South Milwaukee, Wis.

LM

L-M DISTRIBUTION TRANSFORMERS

TRADE TIPS
FOR SALESMEN

HINTS AND HELPS FOR MEN ON THE BUSINESS FRONT

EXTRA ANNOUNCE NEW FRY KETTLE!

COUNTER KETTLE, *with stand, at slight additional cost. Compact, durable, smartly styled. A complete unit for use where counter space is not available. Insures perfect fried food—every time.*

EDISON HOTPOINT PRESENT THIS SENSATIONAL NEW RECTANGULAR AUTOMATIC ELECTRIC FRY KETTLE AT A RECORD LOW PRICE!

Put your money on this trade tip, for it's going to win—and pay handsomely! Think of it! A new fry kettle by Edison, rectangular in design, more brilliant in performance—and at a record low price!

That's news that's worth an "extra" in anybody's paper!

Ten thousand food service operators from all sections of the country designed this new fry kettle. Their needs, based on their experience in serving fried foods, dictated its specifications. They said, first of all, they wanted a fry kettle that was flexible—one that could be used as a counter model with or without a floor stand, or with ranges in their kitchen, as their business might dictate. Second, they wanted a fry kettle of low fat capacity.

"It must have a minimum fat capacity for low fat replacement and quick change in fat temperature," they said. "Further, it must have a maximum possible frying area in relation to its fat capacity; it must be fast; it must be of rectangular shape so that it will have the largest usable surface area, and it must have a straight-down, free-flowing, easily cleaned drain and valve."

And finally—*it must be low in price!*

With these demands in mind, Edison went to work and the sensational new Edison Hotpoint Fry Kettle is the result.

TRADE TIPS • FOR SALESMEN

FOR THE RANGE BANK—*Built to fit and harmonize with electric ranges in modern kitchen range bank. Cool—fries the food and not the cook. Filler plate and back shelf at slight extra cost.*

FOR THE COUNTER—*Smartly styled. New rectangular shape provides more usable surface area. Bright polished front; rounded corners for easy cleaning. Record new low price. Specially designed temperature control.*

3 KETTLES IN 1

The new Edison Hotpoint Fry Kettle is really three kettles in one. It is available, first, as a counter model; second, as a model with floor stand, at slight additional cost, or, third, as a model to fit into the main kitchen range bank. It saves fat because it has a minimum fat capacity of only 25 lbs., with a maximum of frying area. Its specially designed, accurate temperature control assures consistent accuracy and long, trouble-free life. This temperature control is as simple to set as turning to your favorite radio station, and it contributes to economy by proportioning the amount of electric energy used to the number of orders fried. And it has *Calrod*—the famous heating units which unbiased tests have proved to be 6 times longer lived and 11% to 21% faster, than other electric heating units.

OPENS DOOR TO NEW PROFITS

There has always been profit in deep fat fried food, properly prepared. This new Edison Fry Kettle opens the door to new and greater profits. It insures the tasty, delicious appetizing deep fat fried foods that build a reputation—bring customers back again and again—keep the cash register ringing. It reduces food costs while actually increasing the quality of food, and cuts kitchen waste by eliminating food waste—the inevitable product of uncontrolled, inaccurate deep fat frying methods.

Spread the news of the new Edison Hotpoint Fry Kettle, tell your customers about it, demonstrate it, show them the kind of delicious fried foods it produces and then prove to them how it will increase profits and build customer good will.

See the new Edison Fry Kettle at your local electric company or write for full information today.

Edison General Electric Appliance Company, Inc., 5618 W. Taylor St., Chicago, Illinois.

EDISON

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SEE IT • SHOW IT • SELL IT

Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to commercial and domestic customers

Range Tests Show Low Demand Factor

By ARTHUR B. CRAIG
Transmission and Distribution Department, Boston Edison Company

Much interest has been manifested in the operating record of the 241 electric ranges installed in the fall of 1936 at Longwood Towers, Brookline, a noted apartment hotel supplied with electricity by the Boston Edison Company. A description of the service and wiring methods used in this establishment was published in ELECTRICAL WORLD, October 10, 1936. Fifteen months' record is now available from demand meters to show the ratios between the electric range and the total load, and it is noteworthy that on the day of maximum peak, November 22, 1937, the electric range demand represented only 5.6 per cent of the connected range load, although it accounted for 40 per cent of the total installation peak.

These 241 electric ranges replaced gas and are supplied by a new and separate single-phase service. The ranges are not sub-metered, as the apartment rentals include energy used for electric cooking by the tenants. Thus there is every incentive to use the ranges freely, but this is somewhat offset by the maintenance by the hotel of a public restaurant, which is attractive to many of the tenants of this high-class establishment. The restaurant is not as yet using electric cooking.

Lighting, refrigeration and other usage of the apartments is sub-metered. The total load of the hotel includes all suite requirements, public lighting, elevators, garage, small shops, office and other hotel services. The total connected load of the 241 electric ranges is 1,675.7 kw.

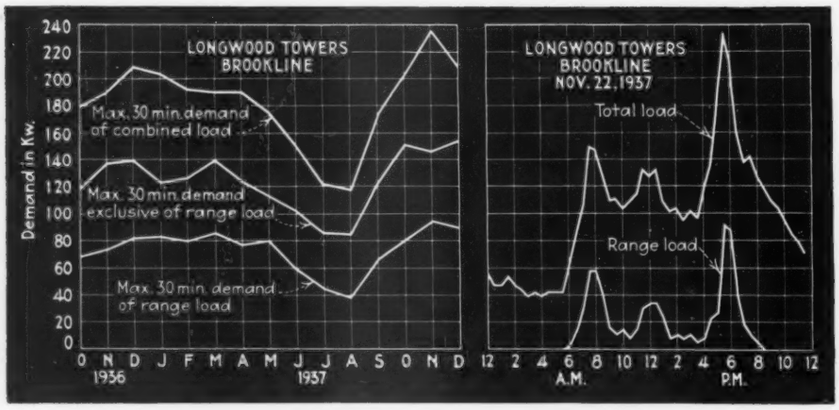


Fig. 1—Monthly demands of apartment hotel ranges and total hotel service. In this case the annual demand characteristics of the range load are, if anything, better than those of the balance of the diversified load

Fig 2—Twenty-four hour load curve of Longwood Towers ranges compared to total hotel usage, on maximum day. Connected load of 1,676 kw. has maximum demand of only 94 kw. at the hour of the hotel peak

The electric range demand on November 22, 1937, was 94 kw. at the peak (5:30 p.m.) and the total hotel demand was 235 kw. at that time (see Fig. 2). The variation of maximum peaks from month to month for the range and hotel loads is shown in Fig. 1 based on measured 30-minute demands, and Fig. 2 shows the 30-minute demands of the maximum day on each class of load. The forenoon peak on this day was 59 kw. for the ranges and 151 kw. for the hotel, between 7:30 and 8 a.m., while the range demand after a later forenoon dip down to 9 kw. to a noon maximum of 35 kw. It is noteworthy that the electric range demand is the chief factor in contributing toward partial filling of the noon valley in the hotel total demand. No energy was used in electric range service between midnight and 5:30 a.m., or after 8:30 p.m.

The high diversity of load provided by these electric ranges cannot be considered typical of ordinary apartment house service, but where this is combined with hotel facilities the Longwood Towers experience as charted may be looked upon as significant.

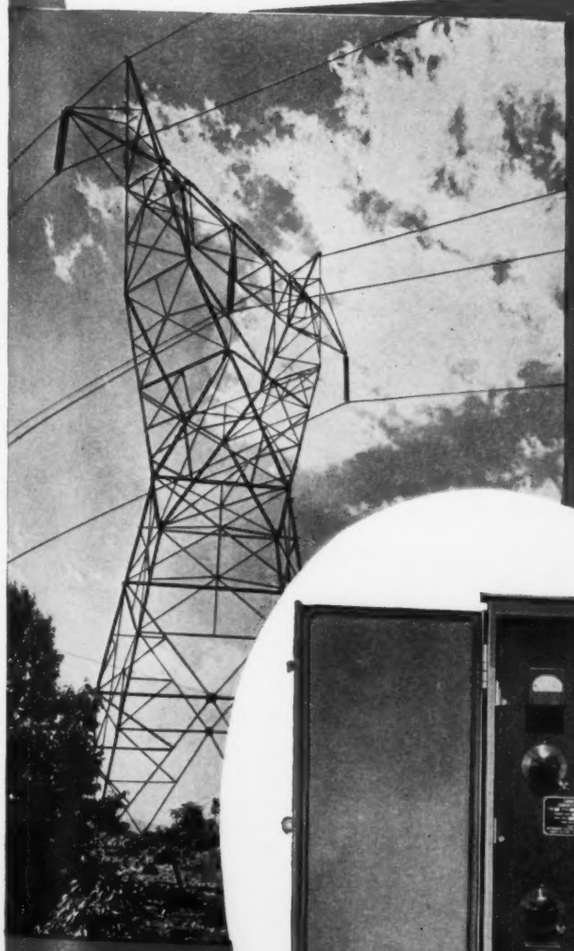
•

Profits to Farmers Demonstrated by REA

In adding load to rural lines, the "value of the service" approach by the salesman of electric service has to be very specific to impress the average rural prospect. Recent specific examples uncovered by REA during 1937 include the following:

Ted Thesins, a farmer of Wells, Minn., has been raising pigs for 30

PROTECT AGAINST FAULTS
to the End of the Line



with WESTINGHOUSE HIGH-SPEED CARRIER RELAYING

Best system operation requires high-speed clearing of faults on transmission lines. Cutting down the duration of system disturbances increases load capacity of the line as well as improving system stability.

Westinghouse developments in high-speed relays have greatly reduced closing time over the majority of the sections. Now, by the addition of High-Speed Carrier relaying, the *whole section can be protected at high speed.*

Since control is automatically taken by relays at the time the fault occurs, the carrier channel can be used for other purposes along with relaying, such as (1) Point-to-point communication, (2) Remote metering (3) Remote tripping.

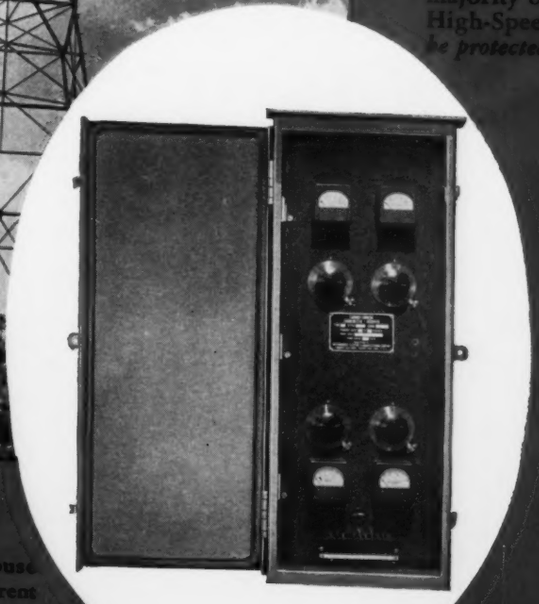
A study of your system will show what Westinghouse high-speed carrier relaying equipment can accomplish in the way of:

1 Better protection over the entire line.

2 Increased load capacity.

3 Improved system stability.

4 Less damage to equipment.



Westinghouse Carrier Current Transmitter-Receiver.

For complete information, call your nearest Westinghouse office. Westinghouse Electric and Manufacturing Co., Newark Works, Newark, N. J.

J-40155

Westinghouse

METERS INSTRUMENTS RELAYS

Investment for the new installation, including wiring, lighting units and sign, totaled only $700

Stock is no more varied than it used to be, says the store manager, but it looks 100 per cent better—6 kw. of lighting load does the job of supplying 18 ft.-candles. In exterior view, note next-door store window at right.

years. By installing 40-watt lights in his farrowing pens Mr. Thesins prevented sows from trampling their offspring. Saving calculated by the farmer is twelve pigs, valued at $60, enough to pay his electric bills for about one year.

J. B. Farrington, a farmer near Chapel Hill, N. C., formerly paid an ice bill of $20 per month during hot weather for milk cooling. Last year Mr. Farrington was using a special milk refrigeration box and ice maker, and yet his electric bill for these and all other uses was only $5.38. He figures that the saving in cost of ice and in reduced milk spoilage will in about two years pay for his $350 milk refrigeration unit.

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Lighting Multiplies Connected Load

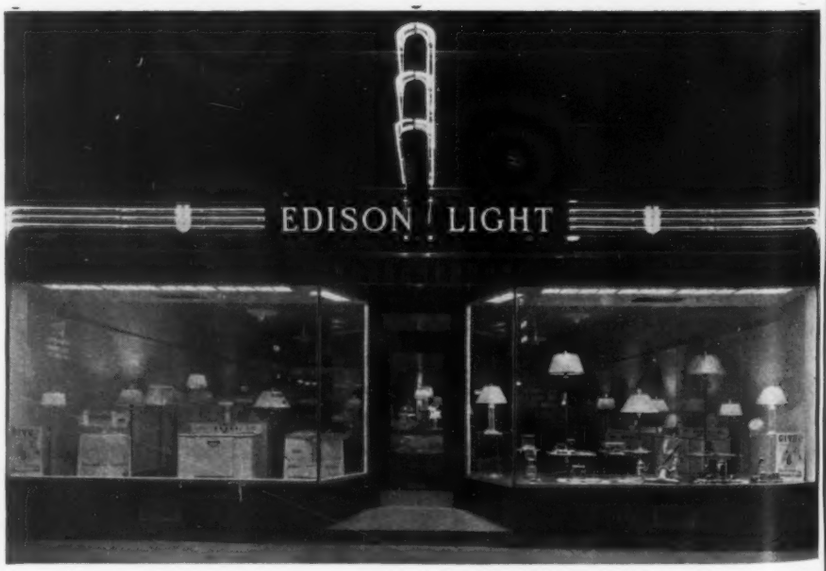
By F. H. PECKHAM
Leominster Electric Light & Power Company, Leominster, Mass.

Moving into a new store recently brought the Leominster Hardware Company face to face with the problem of (1) lighting an interior 4 ft. wider at the rear than at the front, (2) providing an intensity higher than is normally used in neighboring establishments and (3) making the most of exterior opportunities for display and advertising. A comparatively simple layout was desired and at moderate cost. The old location depended on windows illuminated by two 300-watt hanging lamps and floor lighting provided by five 200-watt units suspended from the ceiling. Routine results naturally followed.

At the new store, which is about 100 ft. deep x 20 ft. wide at the front x 13 ft. high to the ceiling, nine 300-watt units were installed on 10-ft. spacing with 10-ft. mounting heights, while to meet the requirements of the rear end three 500-watt units were provided, using Art Metal fixtures in each case. These ornamental semi-direct units deliver about 18 ft.-candles on the counters. The windows are each lighted by six 150-watt Holophane reflectors and across the 20-ft. front of the store exterior is a modern facia type sign 30 in. high and having ten sections of flashed opal glass with black enamel single-stroke letters 18 in. high mounted on 1/16-in. solid stock supported by horizontal mutins. The sign has nine 150-watt lamps.

C. H. Wood, the manager, states that "customers are repeatedly complimenting us on the splendid appearance and comfort of the store; that an appreciable increase in sales has resulted from modernized lighting, and that many visitors comment on the range of the stock, not realizing that such a variety was carried under the older lighting scheme."

UTILITY SETS EXAMPLE FOR CUSTOMERS



Boston Edison's latest standard in its electric shop window lighting is shown in this view of the Codman Square store and office, where each window is provided with seventeen 200-watt lamps mounted 9 in. apart on centers behind Holophane lens plate boxes in flush ceiling layout. This provision of 3,400 watts per window is designed to deliver about 150 ft.-candles on the displays, each window being 9 ft. deep, about 9 ft. high and 11 ft. wide across the front. Over the front in these standard shop layouts a belt type neon sign is furnished, with a projecting sign of similar type border over the doorway. The interiors of these neighborhood shops are brightened by the portable lamp displays in addition to the pendant units shown, and the relatively large use of energy is planned to make these Edison shops stand out above other establishments as examples of intensive and yet glareless illumination in their respective neighborhoods.

THE SIGNIFICANCE OF ADEQUATE WIRING TO THE PUBLIC UTILITY TODAY

THE SIGNIFICANCE of adequate wiring in the consumers' installations to the public utility company today is illustrated most graphically perhaps by three pages in the contemporary history of the utility business as it operates today.

Evidence presents itself from three separate fields—the domestic, commercial and industrial. In the domestic load-building program the gap to be bridged between customer acceptance of the electrical standard of living and his attainment thereof can be bridged, as so many utility men know, only by adequate wiring. In fact, the bottle-neck introduced by inadequate wiring has been such a barrier to the sale of the major load-building appliances that hundreds of companies sell and promote the sale not only of the appliance but also of the appurtenant wiring, without which the customer cannot use the appliance. Where local conditions warrant, numbers of these companies in addition finance the wiring or frequently add it to plant.

In the commercial field are "wiring allowances" of $2 to $6 per kilowatt for bona fide heavy-duty cooking appliances. This inducement is necessary at this stage of the game to equalize more nearly the inherent installation advantages of competitive equipment.

In the industrial field inadequate wiring limits the use of proper lighting intensities, impedes the installation of heating equipment and slows down broad increases in the power load.

Thus on three important fronts we see factual evidence of the fact that the utility recognizes in concrete form the distinct financial advantages which accrue to it, to the extent that it unties the knot of inadequate wiring.

A day or so hence there is to be presented to the utility companies an all-industry program designed to improve the wiring adequacy in new homes to be built and beyond any doubt, through this effort, the natural result should be a steady improvement in the wiring of millions of other homes. On pages 46 and 47 are described the elements of the program. On succeeding pages there follows a broad treatment of the subject over the three-part range of utility operations as prepared by utility authorities. The presentation is offered by ELECTRICAL WORLD as a contribution to current thinking on this important, timely subject.

NEW HOME STANDARDS Set Pace for Older Houses

By MERRILL E. SKINNER

Vice-President Buffalo, Niagara & Eastern Power Corporation, Buffalo, N. Y., Vice-Chairman Executive Committee, National Adequate Wiring Bureau

IF LIGHTS and appliances were run by wireless, we folks in the utility business might be justified in a mild and academic interest in the subject of wiring. But such cannot be the case so long as it is still necessary to connect each and every current-consuming device to the end of a wire before it will begin to turn the meter. In fact, so long as electrical equipment must be connected to wiring before it can be useful it behooves every one in the industry to take an active interest in the subject.

Broadly speaking, I am convinced that the industry does have this interest and fully appreciates the fundamental importance of the wiring problem, although each branch may approach the problem with a different point of view. I can understand that, too, for the electrician wants work, the manufacturer wants material, the utility wants kilowatt-hours and the customer wants electrical service at the lowest price obtainable. For best results, each branch of the industry must co-operate and recognize the rights of the others to a legitimate share of the business.

In the past there have been many attempts on the part of one or another branch of the industry to peg its share of the customer's wiring dollar, and these efforts have provoked endless discussion within the industry, all of which has got us nowhere as far as adequate wiring is concerned. In the long run, any attempt to secure more than a normal share of the public wiring dollar will hurt every one, for we must all face the fact that full electrical service is not indispensable. The public will turn to something else or will get along without our service if confronted with expense, either initial or operating, which is not considered competitive as far as the service in question is concerned.

Public acceptance necessary

The real task confronting our industry is to make the public want wiring so badly that it will buy more of it readily. If we all work together I am sure we can make the public want more wiring even at present prices and under the present conditions surrounding installations.

The program of the National Adequate Wiring Bureau, just announced, approaches the problem from this point of view. It tells us in brief to each do our bit in selling the public on the advantages of adequate wiring and suggests that if we coordinate and synchronize our efforts the sum total of such individual efforts is bound to have an important influence on public attitude toward wiring. Its objective certainly merits broad support from every branch of the industry. If such broad support is forthcoming the success of the endeavor is assured, for we in the electrical industry have ample evidence as to the power of a united industry promotion.

Our experience confirms this in every field in which it has been tried—Refrigeration, Better Light-Better Sight, Kitchen Modernizing, Water Systems and Electrical Housewares.

The amazing thing to me about these national programs is the way they succeed in spite of spotty local support. One is led to the conclusion that if the local support were universal the sales power of these programs would be well-nigh irresistible. Adequate wiring should certainly draw a wider support than any of its predecessors due to the greater number and greater mutuality of interest of the electrical fraternity affected.

In our own company we believe in atacking the problem at its inception. We endeavor to contact every new home built in our territory, every rural customer connected to our lines, every new or remodeled store or factory in an effort to sell them adequate wiring before they hook up to our lines. We don't worry so much about the old installations, although we are thoroughly alive to the restrictive influence of inadequate wiring on business. We know that it is the new installations which set the pace in any community, and if we get proper wiring accepted as an essential in all new buildings we believe that competitive rent pressure will influence owners to modernize their wiring much more effectively than we would hope to with no end of sales effort.

Recently we checked seventy-three new homes in which we had made 5-Star recommendations—Star No. 1 being adequate wiring. Our recommendations called for an average of 99

outlets per home, whereas independent local building practice would have installed somewhere in the neighborhood of 55. We found installed an average of 86 per home, which represented an increase of 56 per cent over builder practice and an 87 per cent acceptance of our recommendations. I do not know how much more it cost the builder for this added wiring, but I do know that we sold the builders on the desirability of spending whatever it cost to increase the salability of their buildings. We persuaded them that the added value was worth the cost. I know, too, that there will be few who will argue as to the substantial increase in electrical consumption in a home provided with 99 outlets as compared with one provided with only 55.

I am satisfied in my own mind that progress along these lines will eventually bring a terrific pressure to bear on the owners of older dwellings and that eventually they will be forced by the pressure of public opinion to undertake the necessary modernization. That is no reason why every effort should not be made at the present time to modernize these old installations, but we have not been smart enough to find the real answer to that problem yet and, in the meantime, are concentrating our energies on the new structures in our territory.

I predict that the national program will have a success parallel in every respect to that of its predecessors in the field of national promotion.

By J. L. FARRELL
Sales Manager, Electric Department,
Public Service Electric & Gas Company,
Newark, N. J.

Local Co-operative Programs AID RESIDENTIAL WIRING

BECAUSE of the comparative simplicity of residence lighting, highly specialized lighting technique is not necessary in this field. Thus the sale is easier due to quick understanding by the customer and the situation permits employment of non-technical salespersons in so far as lighting technique is concerned. The proposition resolves largely into a question of disseminating proper information to the great bulk of residence customers and then determining just how much each one of these individuals will purchase.

Specifically to state the functions of the various interests which make for the whole electrical industry would start an argument promptly, and no one ever wholly won an argument. Probably the sane method of approach is to determine what definite steps need be taken, then what can be done by the various branches of the industry and, finally, how to distribute the work to insure all phases being covered.

No plan is successful in any market unless all participants profit. It would be easy for any part of the industry to shirk work unless the profit motive was the driving force.

Establish a profit motive and each part will spend of its time and money about in proportion to benefits received, and not much more over a long period of time. The electrical industry is a business not different in fundamentals than any other business.

A customer buys some wiring—the output of the entire industry is augmented—every one should profit. Hence, it is reasonable that all parts of the industry—manufacturer, distributor, contractor, utility—should interest themselves to insure that customers buy wiring, and it is not reasonable to assume that the total job of insuring profitable sales falls to any one particular part of the industry.

The prime requisite of any sales plan is the exposure of goods or services to possible purchasers, usually by written word and personal call. In a program of residential wiring, advertisements will need to be largely educational in character, designed primarily to sell an idea rather than a specific article at a stated price. Since the contractor-dealer must devote his advertisements strictly to calling attention to his ability as a craftsman and might not realize a direct profit from educational or idea advertisements, this greater part of the educational advertisement selling must be supported primarily by the utility. In order that ample expenditure for direct literature costs, stocking and personal sales assistance to contractors be assured, this phase can be absorbed by the distributor or jobber. The contractor will need to employ sales personnel as his contribution to compensate for his profit from this increased business. The manufacturer can care for national educational advertising and the development of promotional methods.

This entire program needs to be carried on with a comfort tone, as to attempt the increased wiring through a technical description of possible haz-

ards can be met with discount by the customer in many instances, due to his experience over a long period with a minimum of real trouble to date, whereas the comfort or convenience appeal offers a direct benefit only obtainable through additional wiring, switches, etc.

In New Jersey a program much like the one described is now in process of promotion. The Market Development Committee of the Essex Electrical League decided upon the outline. Analysis led to the conclusion that the electrical contractor needed a door opener for his sales approach and the combined group decided that a load center answered the door-opener question. Briefly, this is what has happened up to the present time:

1. The utility distributed to a selected list of its customers a brochure describing in words and pictures a design for residential wiring, showing load center, switches, etc., conveniently located. The utility carried in all regular ads a block devoted to the advantages of modern wiring and proposes to increase this phase

INSUFFICIENT WIRING in

By ROY A. PALMER

Illuminating Engineer
Duke Power Company, Charlotte, N. C.

FOR many years much has been said and words have been written in sufficient number to fill volumes on the subject of adequate wiring, yet the greater proportion of wiring installed today meets only code requirements. Electrical contractors, utility men and even some consulting engineers lay out wiring on the basis of carrying capacity of wire without regard to voltage drop or future requirements.

The unfortunate part of it all is that every one is a loser when inadequate wiring is installed, and, as is usual, the customer loses more than any one else. The contractor could sell a greater volume of material and labor, which, in turn, reflects to the advantage of the jobbers and manufacturers. The utility not only loses in volume of current sold to the customer but also risks unfavorable customer reaction because of interrupted service, low voltage and generally poor service, all of which are not the fault of the utility, but of the customer's poor wiring on his own premises. For these reasons adequate wiring deserves strong, aggressive and continuous promotion by utilities.

We can compare wiring and kilowatt-hour sales to highways and automobile sales. If it were not for the good roads and highways, our automobiles would not be as useful and of as much value to us as they are. Similarly, wiring is the highway over which electric service is sold, and poor wiring not only limits the use but depreciates the value of the electric service to the customer.

If we analyze a specific case, a better conception can perhaps be had of the losses in revenue due to poor wiring. An industrial plant wiring system for lighting was installed several years ago according to minimum code requirements with insufficient wattage allowance per outlet to provide for future increases. The demand for more illumination brought about the use of larger lamps, loading up the circuits to full capacity, and in some cases overfusing was resorted to in order to avoid interruption of circuit by blown fuses. Excessively long runs of circuits together with the overloading brought a 10 per cent voltage drop. The wattage on the average dropped to 85 per cent of the rated wattage of the lamp. There was perhaps an I^2R loss of 5 per cent in the wiring. If we estimate a 10 per cent over-all loss in the 30-kw. lighting load of this plant the annual loss at 2,000 hours operation will amount to 6,000 kw.-hr. At 1 cent per kilowatt-hour this is $60 per year revenue loss from this one plant alone. This is $2 per kilowatt connected load. Many plants have wiring conditions which cause a greater loss in voltage and a correspondingly greater loss in revenue ensues. However, even if the average loss per kilowatt connected is only one-half of the above case—$1—it is still a significant figure.

It was stated above that the customer loses more than anyone else. In the case just cited the customer may appear elated at the reduction in wattage consumed until he learns that the light output of the lamps was decreased almost 30 per cent. Since the wattage was not reduced in like proportion, the cost per foot-candle was approximately 15 per cent higher than if the wiring were such as to permit operation of lamps at normal voltage. Other less tangible losses must not be overlooked, such as lowered production, greater spoilage and accident hazard due to interrupted as well as decreased illumination. In the case of power wiring, slower heating, interruption of manufacturing processes and generally unsatisfactory service can often be charged to inadequate capacity of the wiring system. Processes depending upon air conditioning and humidification may suffer seriously due to failure in holding to proper values because of poor wiring.

What are the remedies?

How can this wiring situation be remedied? The difficulties encountered in the sale of adequate wiring cannot be overcome until all branches of the industry fully realize the seriousness of the poor wiring which is installed generally. It will require the wholehearted support of all groups to educate not only the public but the individuals in the electric industry, as well as architects and others responsible for wiring installations, as to how costly

of the plan. The utility built an exhibit in its main office and demonstrates to customers the benefits of increased wiring.

2. Distributors interested the contractor group in the load center as a door opener both at meetings and via distributor salesmen. In addition, they furnished pamphlets and sales educational help.

3. To date (the program is of recent origin) a substantial number of contractors have made customer contact.

4. Results are satisfactory to all who have participated.

It is too early to prophesy the total results which will obtain, but it is known definitely that sales are not too difficult and that interest is increasing. The program is spreading to other parts of New Jersey.

Incidentally, the picture of present fixtures in houses wired back in the early part of the century passes before the mind's eye, and a conservative estimate that there is $50,000,000 worth of replacement fixture business waiting for some program is not too much of a stretch of the imagination. I wonder if it could not be incorporated in the wiring program.

FACTORIES Restricts Utility Revenue

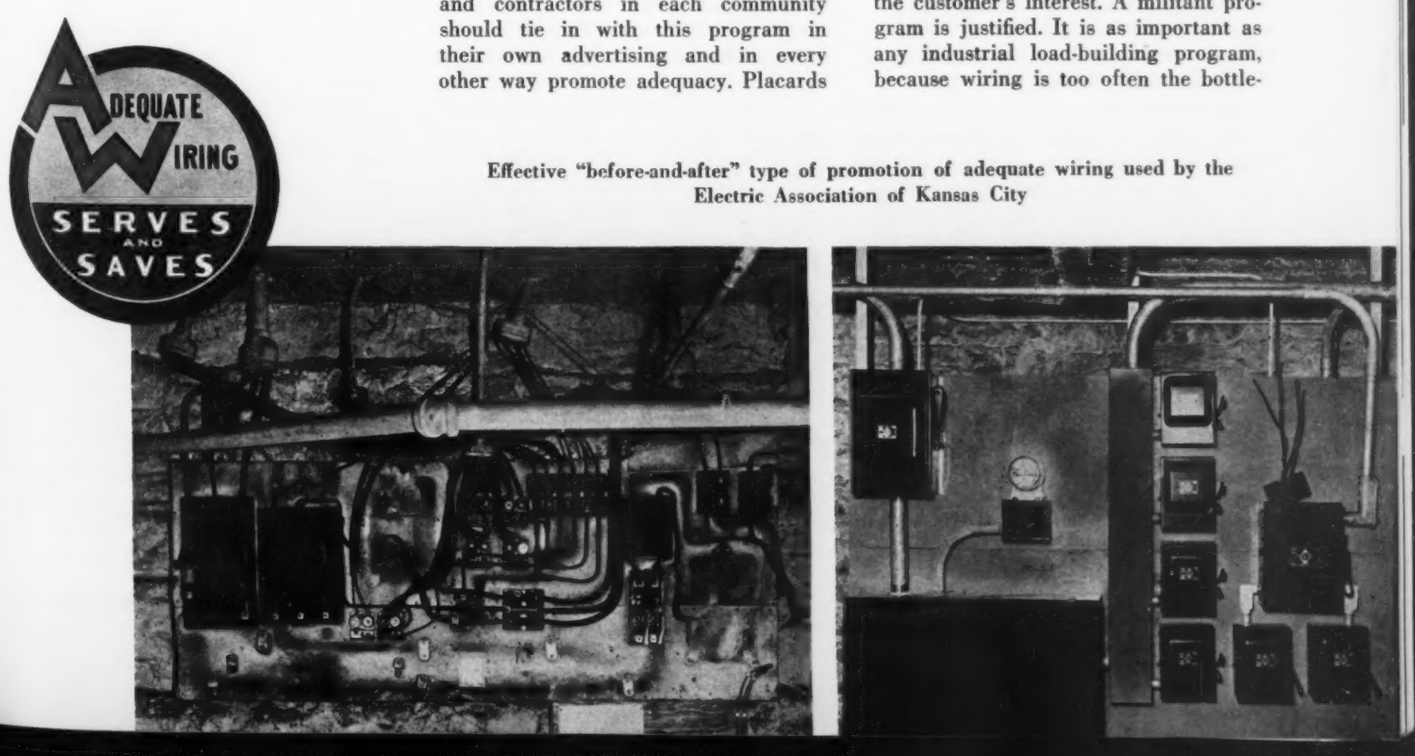
cheap wiring actually is. The code should be respected as a safeguard to life and property, but it should not be in any sense considered a standard. In this respect the Handbook of Interior Wiring Design should be promoted and the code relegated to the background.

Voltage drop should be a criterion in wiring design instead of carrying capacity of wires alone, as has been largely the case in the past. It would be well for designers of wiring systems to study the progress of the electrical industry from the standpoint of increases in the use of electric service so that past experience will permit better judgment in planning wiring for future needs.

The handbook will permit the training of architects, contractors, and others responsible for wiring plans, how actually to *design* for adequacy instead of laying out wiring by guesswork or by the limits of the code. The utility can lead the way in such an educational program. The handbook should be given wide distribution in each community, from the college classroom to the architects, engineers, contractors, builders and others, but with the distribution should go a training in its use. Wiring schools may be arranged to advantage.

A strong program of local advertising should be carried on pointing out the economy of spending a few more dollars for complete wiring rather than saving a little on the initial installation and paying dearly and continuously in uneconomical service. Jobbers and contractors in each community should tie in with this program in their own advertising and in every other way promote adequacy. Placards in jobbers' salesrooms should emphatically remind the contractor that No. 14 wire has no place in an adequately wired plant and that he loses when he sanctions its installation, and his customer loses even more. All this program should tie in closely with the national advertising by manufacturers.

The program of education, training and selling of adequate wiring should be continuous. Developing a wiring consciousness in the mind of the ultimate consumer cannot be accomplished with a program even moderately long in duration. The evils of inadequate wiring in industrial plants, where electric service is constant over a period of many hours each day, are of such great import to the customer that it becomes a responsibility of the utility to attack this problem aggressively in the customer's interest. A militant program is justified. It is as important as any industrial load-building program, because wiring is too often the bottle-



Effective "before-and-after" type of promotion of adequate wiring used by the Electric Association of Kansas City

neck which prevents the sale of more lighting, heat and power.

Wiring meetings with plant superintendents, maintenance, and operating engineers should be a part of the promotional program. Such meetings can perhaps best be sponsored by the utility company, but should have the active participation of electrical jobbers and contractors. These meetings should be made as interesting as possible, avoiding long discussions by a speaker, but rather the presentation of the wiring story by charts and demonstrations to clarify the subject.

The national program of wiring promotion is an opportunity that comes none too soon to relieve the present wiring situation, which, when compared with the needs and requirements for even reasonable adequacy, is nothing short of atrocious. It will help to promote electrical modernization in industry and thereby create sales for contractors not only for wiring but for new lighting, more motors, heating appliances, controls and other industrial materials. It provides an opportunity to create an entirely new wiring viewpoint on the part of plant executives, contractors, jobbers, utility men and others. It can be the means of breaking the shackles which for so long have been a hindrance in the greater use of electric service and an economic waste in unnecessary losses in the plant.

NEW METHODS WILL HASTEN Commercial Building MODERNIZATION

By J. D. NOYES

Detroit Edison Company, Detroit, Mich.
Chairman Wiring Committee, Edison Electric Institute

THE utility interest in inadequate wiring is very real, but has often been misinterpreted. That interest involves more than the sale of kilowatt-hours, although that increased use is of more than passing importance, not only to the companies but to the public they serve. It extends to the development of increased use by the public of the labor-saving electrical conveniences of carrying on the work of the world. It therefore is concerned with the design and distribution of utilization devices and with the wiring through which energy is delivered to them. That interest, therefore, is not selfish, but involves the well-being of every electrical group in order that all may contribute to the public service.

In such a program artificial and unnecessary burdens and restrictions upon electrical use, not essential to safety, have no place. It is necessary to realize that the added business which we seek is strictly competitive in nature, and is obtainable for the electrical industry only under competitive conditions. If those conditions are not recognized and fairly met the electrical industry as a rule does not get the business. The customer weighs the advantages he obtains against the cost, as he does in any other business transaction. He is accustomed to use a little bit of indifferent lighting—added illumination for decoration, for advertising, even for better seeing are considered in the light of direct returns. Electricity is not the only agency generally available for cooking, water heating, refrigeration or for industrial heating of many sorts. Better commercial lighting is measured against increased publicity of other kinds.

One of our serious problems today is the provision of adequate copper in the wiring systems of existing fireproof structures at a cost commensurate with the estimated benefits of the new electrical uses proposed. The existing raceways must be used whenever possible. Their replacement involves heavy expense and inconvenience. Means must be found to use them more efficiently than has been the practice in the past. Such means are available, once we recognize the fact that the business depends upon acceptable modification of these old practices. Existing duct systems, especially those of the final run, must be more completely "filled." This involves the modification of a National Electrical Code rule limiting the use of conduit space. It also involves the development of new types of wires having thinner but equally good insulation coverings. In some cases it involves the use of that much-abused, but technically sound, practice —common neutrals without insulation. In such ways the capacity of existing duct systems can be more than doubled.

In a recent negotiation involving a 60-apartment building the business was secured for the electrical industry in large part because the most advanced practice was used in designing the feeder system for the electrical ranges in the kitchens. If the range business had been lost electrical refrigeration and bathroom heater business also was lost. Many electrical groups therefore benefited by the use of practices known to be safe and technically good, but which are at present beyond the scope of recognized industry regulations.

New developments—experimental installations of the sort just described—should have the co-operation of every electrical group. Only in that way is progress possible. A standardized industry is a static industry—finished—complete. The electrical industry is not yet ready to accept a rigid standardization that will hamper future developments.

SURVEY OF OPINION in the Public Utility Industry TODAY

SUMMARY OF QUESTIONNAIRES

Taken as a whole, the public utility industry today is busily engaged in the active promotion of adequate wiring in the home, in the commercial establishment and in the factory. Such is the evidence presented by questionnaires received by ELECTRICAL WORLD from nearly one hundred companies located in 35 states.

The three questions which were asked utility companies are given on these pages together with a very few of the many replies to the questions.

These replies show that utility companies are busy on vigorous campaigns to expand the advantages, both to themselves and to their customers, which accrue from adequate wiring. National programs, local advertising of all kinds, architects' bureaus, builders' groups, dealers' associations, contractors' groups, planning services, surveys of customers' installations, exhibits in store windows and at county fairs, financing the cost of wiring and subsidizing the cost of wiring for major appliances—both residential and commercial—electric home exhibits, certified wiring plans, demonstrations before schools, civic clubs and lodges, are among the many promotional tools used by utility companies today as evidenced by their replies to the Adequate Wiring questionnaire.

1 *What does adequate wiring in the consumers' installations mean to the utility company? Residential — Commercial — Industrial. (If you prefer, illustrate by specific cases.)*

The installation of adequate wiring in every home on our lines today would not only mean a tremendous increase in the use of our service through further convenient use of present installed equipment but would open new markets for our company and dealers for the sale of additional equipment, which would, in turn, mean an increase in kilowatt-hours. The wiring problem is becoming more acute every day in the merchandising of our service as it is an obstacle in the majority of instances for the sale of additional equipment for the use of our service.—FLORIDA POWER & LIGHT.

Pleased to submit the attached reprints of an advertising campaign now in progress which is designed to focus attention on the need for convenience outlets in the homes of our customers. These advertisements were supplemented with a bill insert which was sent to all of our customers during the month of January, and spot announcements on the radio featured the value of convenience outlets and adequate wiring as a means of securing the maximum convenience and benefit from the use of electrical appliances in the home.—PACIFIC POWER & LIGHT.

We have no definite figures to show the value of adequate wiring in commercial and industrial premises. It would seem that adequate wiring in commercial and industrial installations is equally or more important than in residential installations. Therefore, the subject of adequate wiring in the consumer's installations means a great deal to the utility, and should be given a great deal more study and consideration than it has been in the past.—KANSAS CITY POWER & LIGHT.

Adequate wiring means satisfied customers. Added load can then be sold without new wiring expense to customer.—EL PASO ELECTRIC.

As a general proposition, if the wiring in any customer's premises is adequate to carry an additional piece of equipment the sale of that equipment is made easier because of this fact. In connection with commercial installations we found during the past year or two a great many instances where customers were willing to install larger lamps, but could not do so because all wiring to the lamps was inadequate. This meant that our lighting salesmen, in addition to selling the customer on paying more for lighting, was also obliged to sell the customer on revamping the wiring.—NORTHERN STATES POWER.

Adequate wiring of residential property increases the market for wiring material and appliances from approximately $500 to $1,500 without air-conditioning equipment, and to $2,200 including air-conditioning equipment. It also increases the possible revenue to the company from $40 per year per customer to $160 per year per customer. Adequate wiring for commercial and industrial installations makes possible an increase of 250 to 300 per cent in lighting.—SAN JOAQUIN LIGHT & POWER.

Adequate wiring in the consumer's installation means sufficient outlets conveniently located to serve all available electrical appliances. Outlets should be spaced close enough to prevent unsightly cords being in view. Still

more important, adequacy means sufficient copper to not only take care of present requirements but reasonable future increases. We also believe that the service and service entrance facilities should be at least 100 per cent over present needs.—SOUTHERN CALIFORNIA EDISON.

Adequate wiring is the first prerequisite to any satisfactory customer, whether he be classified residential, commercial or industrial. Most complaints about utility service (particularly low-voltage complaints) are directly traceable to inadequate wiring.—SIERRA PACIFIC POWER.

It means efficient and economical use of electric services. Elimination of losses both electrical and those due to reduced speeds or improper operation of equipment. The ability to increase the use of electric service without attendant expense and without losses. It means a real opportunity for the utility to sell its services—MISSISSIPPI POWER & LIGHT.

2 ***What is your company now doing to promote adequate wiring in old and new customers' installations? Residential—Commercial—Industrial.***

The company endeavors to promote adequate wiring by making its entrance requirements larger than those required by the Underwriters. This seems to be the "bottleneck" which prevents additional heavy-duty appliances being added because of the cost of the entrances. This applies primarily to residential services. In commercial and industrial services the company reviews the premises and makes definite recommendations to the customer for its wiring requirements, to meet not only its present load but also its proposed additional load.—ROCKLAND LIGHT & POWER.

Residential—(a) Finances cost of wiring new or old homes for rural customers provided cost does not exceed $100. (b) Finances cost of installing outlets for any residential customer provided cost does not exceed $30. (c) Installs range or water heating wiring, for a charge of $15 to the customer.

Commercial and Industrial—(a) Finances cost of new wiring or changes in existing wiring provided cost does not exceed $200. (b) Provides, free of charge to customer, wiring and piping for commercial heating and cooking equipment provided total cost does not exceed $6 per kilowatt.—GEORGIA POWER.

Three-wire entrances for all new residences. A large amount of "corrective" wiring done when range or water heater is installed. A $5 per kilowatt allowance made on all commercial cooking equipment sales.—BROCKTON EDISON.

Schools for electrical contractors, wiring and outlet campaigns for electrical contractors, personal sales interviews with customers having inadequate wiring, contemplated load increases and proposed new construction.—NEW ORLEANS PUBLIC SERVICE.

Residential—Furnishing at no cost to customer a heavy-duty service entrance if building is wired in accordance with Red Seal standards. Devoting part time of 50 field men to contacting customers in order to promote adequate wiring in homes and farms. Furnishing customers free wiring layout service and specifications where desired. Co-operating in demonstration homes where wiring is featured, and newspaper advertising featuring wiring in connection with such homes. Developing lower cost wiring installations through experimental materials and methods.

Commercial and Industrial—Employ 25 field promotional men who, as part of their regular work, promote adequate wiring in commercial and industrial structures. Free wiring layout, which includes formal detailed specifications if the customer so desires.—WEST PENN POWER.

All of our representatives, comprising residential, commercial, lighting, power, farm electrification, as well as service men, are urging the greater number of convenience outlets and larger branch circuits. We also have made use of a demonstration kit to illustrate the losses through voltage drops due to inadequate sized circuits.—PUGET SOUND POWER & LIGHT.

Through the contacts of our field representatives in all three branches with builders, owners, contractors and architects, we are promoting the need of adequate wiring and will render a complete service in preparing plans and specifications.—POTOMAC EDISON.

3 ***What is your company planning to do this year to promote adequate wiring in consumers' installations? Residential—Commercial—Industrial.***

To contact 25,000 residential and 9,000 commercial customers as well as architects and builders and to demonstrate adequate wiring as well as the advantage of better lighting. Continue to offer a finance plan on consumer's wiring installations. See that all architects, contractors, and builders have access to "Handbook of Interior Wiring Design."—ALABAMA POWER.

We are continuing with the Electric Institute of Kentucky, and over the signature of this Institute we are running ads promoting the idea of adequate wiring in one hundred and two newspapers in the State of Kentucky. In addition to this we are contemplating the distribution of circulars, with our bills.—KENTUCKY UTILITIES.

Our lighting layouts include wiring layouts. Power wiring layouts will be made if the customer requests. A pamphlet to sell the idea and assist in planning adequate wiring has been prepared and is sent to people who are building homes either for sale or their own occupancy.—CONSOLIDATED GAS, ELECTRIC LIGHT & POWER OF BALTIMORE.

Company carries on a continuous educational program with all architects, electrical contractor dealers, building contractors, lumber companies and prospective builders on the matter of adequate wiring. This work is supplemented by literature dealing with the subject, but too much stress cannot be placed upon the importance of personal contact. On all new buildings and whenever any remodeling is being done on old buildings, etc., this company makes a serious effort to lay out the wiring installation and write specifications for same.—MONTANA POWER.

Contact all new homes and furnish layouts of proper wiring, install adequate service entrance in old homes as required. Contact all new building and make recommendations. Always attempt to limit lighting outlets per circuit. Furnish all industrials with wiring information supplied by the Anaconda Copper Company.—HARTFORD ELECTRIC LIGHT.

Educational activity on use of proper voltage lamps. Distribution of handbook of interior wiring—also to architects and those electrical contractors throughout our territory who are concerned with wiring. Industrial tie in with Anaconda Wire & Cable Company's program. Development of customer consciousness of importance of wiring to production. Cooperation with contractor dealers in developing the industrial wiring market.—WISCONSIN LIGHT & POWER.

Our Electrical League and our own company forces have the subject on the griddle at this time and we are trying to work out some long term program which will produce some results in selling more adequate wiring to home owners.—MILWAUKEE ELECTRIC RAILWAY & LIGHT.

ELECTRICITY • *Where will you have it?*

THE day of the "electrical center" in a room has passed. Clustered systems are out, as well as dangerous dangling wires. In relation to demand, adequate distribution of outlets is essential for all present and future requirements.

For the last ten years the Electric Industry has prescribed adequacy, and emphasized the necessity into definite demand for a "means" of adequacy elastic enough to stretch into years of undeveloped electrical future.

What is adequacy? The Ambler, "ample for grades up to 45%" was adequate in 1905, but not today—ten dollars may see you through today, but not tomorrow. Adequacy is as variable as demand.

People are sick of inadequacy. This is strikingly emphasized by the fact that in the average home, 60% of the household appliances are on the shelf unused, due to the lack of electrical plug-ins. A situation that might be compared to a lot of water pipes without spigots.

What would you do if all the gasoline sold in your city was delivered from one place and must be poured from cans with single spouts. Things would be in a pretty mess, wouldn't they?

Modern distribution solves such problems. Outlets are placed in relation to demand. As demands grow, outlets grow until they are conveniently adequate.

The big problem in wiring is in convenience, of contact, lack of contact. They want electricity "at the tip of the finger" —4—8—12—600 outlets! The servant that appears by magic.

Under old methods, imagine a house of 600 outlets instead of 30, imagine a tangle of cords and plugs—inconvenient, conspicuous, dangerous, and finally, overloading the circuits and causing loss of current.

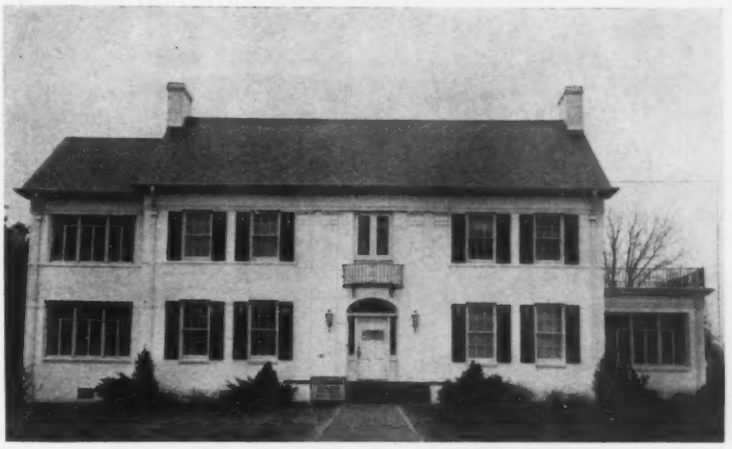
Electrical service for a multitude of home uses has changed the entire nation's standard of living. Lighting has been supplemented by every kind of electrical convenience, except the convenience of use.

The modern residence, with 671 outlets (plug-ins) practically invisible, at finger tip, has plug-ins exactly where you are standing, the plug-in exactly where wanted regardless of any change of ideas or future use requirement.

The means of true adequate distribution is at hand. "Plug-In" Strip provides adequate outlets, 6 or 18 inches apart, for all present and future requirements. No longer is the outlet an eyesore, it is as inconspicuous as the ditto mark. Embedded inconspicuously in baseboard, it is fed by suitable main circuit wiring in lengths from two to six feet and multiple or assorted lengths to entire length and breadth of room.

It is now important to avoid electrical obsolesence. We must prepare for expansion; for 20 to 40 years of electrical future; for an increasing number of appliances and outlets. It is generally believed that unless a house is adequately wired, it will be as unrentable and unsaleable ten years from now as the unwired house is today.

"Plug-In" Strip is a concealed surface raceway, factory assembled in three styles: Flush, Baseboard and Chair Rail. All fittings are standard.



THIS RESIDENCE HAS 671 OUTLETS

The home of tomorrow will have 600 outlets, unseen, for cooking, laundering, comfort, health and entertainment. Electricity will be the cheapest way of offsetting other higher costs. As the "means" to this end, "Plug-In" Strip is the "must" in modern building. Without it a house is obsolete. You can't afford to be without "Plug-In" Strip in your home anymore than you can afford to be without electricity.

"Plug-In" Strip puts an end to screwing out lights or disconnecting other appliances—lamps, lighters, fans and radios can be arranged for convenience, and furniture can be placed for comfort without considering plug-ins—now you never need crawl into corners in search of sockets.

Don't run appliances to outlets, run outlets to appliances.

Present buildings will now be rewired inconspicuously with full advantage of adequacy provided by "Plug-In" Strip, using present wiring outlets for feeders, carrying plug-ins around entire room or any portion.

New buildings, stores, offices, residences, hotels, hospitals, will install the multiplicity of convenience plug-ins instead of the occasional outlet.

The "means" of adequacy is "Plug-In" Strip. Additional data—short Form Master Specifications for Architects—plans for Utilities—Handbook for Contractors—Catalogs—supplied free. Samples supplied from principal office.

NATIONAL ELECTRIC PRODUCTS CORPORATION
1300 FULTON BLDG. PITTSBURGH, PA.

Please Send Catalog & Handbook on Plug-In Strip.

Name .....

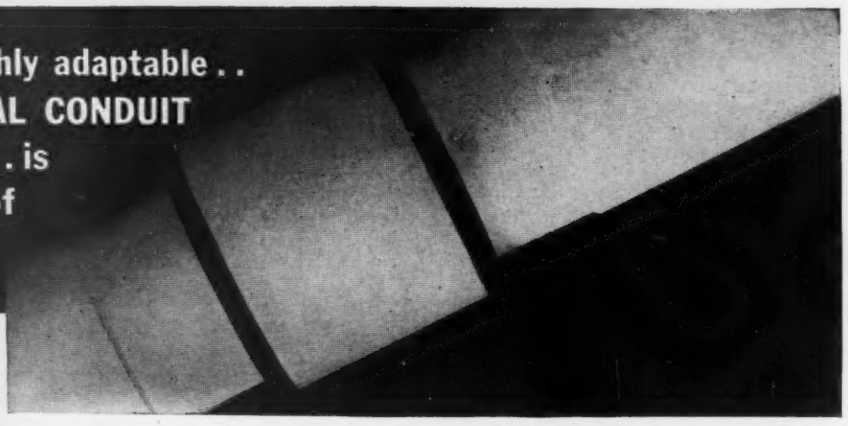
Street .....

City & State .....

(adv)

CHECK ITS ADVANTAGES AGAINST YOUR REQUIREMENTS!

Permanent . . thoroughly adaptable . . TRANSITE ELECTRICAL CONDUIT saves on installation . . is your best assurance of trouble-free service



SO STRONG it goes down without a concrete envelope, Transite Conduit eliminates your concreting costs. And its asbestos-cement composition assures resistance to corrosion . . . continued economical service.

JUST how severe are your electrical-distribution demands? Do they call for a conduit of proven durability? One suited to a wide variety of service conditions . . . yet providing permanence and economy under each? Then check the advantages of Transite Conduit . . .

An asbestos-cement product, Transite Conduit is strong enough to be laid underground without a concrete envelope. Result: immediate large installation savings.

Above ground, in all exposed locations, its durability is your best assurance of lasting service that is virtually free from maintenance. Transite is highly resistant to corrosion—immune to rot and decay. And it is incombustible—weatherproof—unharmed by smoke or most corrosive fumes.

Johns-Manville TRANSITE ELECTRICAL CONDUIT

WEATHERPROOF — incombustible — Transite Conduit permanently solves conduit problems on all exposed locations. It is unharmed by smoke or most corrosive fumes and assures maximum effectiveness under severe service conditions.

For "Concreting-in". . . Specify Transite Korduct

Thin-walled companion to Transite Conduit, J-M Korduct is the material to use where a concrete envelope is necessary. Its light weight and long lengths cut down on your material and handling charges. And wherever used, Transite Korduct's advantages assure continued, efficient service at negligible maintenance. For information on Transite Conduit and Transite Korduct, send for our data-sheet manual. Address Johns-Manville, 22 E. 40th St., N. Y. C.

LOWER IN COST than Transite Conduit, because of its lesser wall thickness, J-M Korduct effects important savings wherever a concrete envelope is called for. On this typical transmission system, its exceptionally light weight and long lengths cut handling charges to the bone.

COURTESY
EDW. G. BUDD MFG. CO.

A full days journey for the pioneer's covered wagon is today a ten minute run for this new stream-liner. . . . .

. . . . Yet every day we are demanding more and more speed. Faster and faster our trains whiz across the continent. Today the tracks of this country's railroads are dotted with high speed, light-weight trains like the Burlington's "Zephyr," the Boston & Maine's "Flying Yankee," the New Haven's "Comet" or the Union Pacific's "City of Denver."

This new type of train would never have been practicable – nor profitable – if it had not been for the development of new light-weight, high strength metal alloys which have been designed especially for the job of reducing bulk and increasing strength. Conventional materials, those that we have known for years, have been relegated to the shelf and in their places we have accepted the newer, stronger, lighter, less bulky materials provided by modern scientific research.

It is to this latter group that Simplex-LATOX rubber insulation belongs. It is designed to provide small diameter, light-weight, moisture-proof cable for supervisory control of utility sub-stations, police and fire alarm, telephone and signal service and electric or steam railroad control or signal systems. It is the ideal insulation for communication, signal and control cables. For all such applications it combines the advantages of rubber and paper insulation yet exceeds but little the small diameter and light weight of dry paper insulated cables heretofore used.

Simplex-LATOX rubber insulation is water-proof, permanent and retains indefinitely the qualities of high-grade rubber insulation. It is made directly from prevulcanized rubber latex and is deposited on the conductor in a series of films to form a thin homogeneous wall of high-grade rubber insulation **containing not less than 93% rubber** and having uniform physical and electrical characteristics.

It was perfected in Simplex Laboratories to meet a definite need caused by modern day conditions. It was designed especially for the job of reducing bulk and increasing those physical and electrical properties necessary for efficient insulation – thus increasing possible payload or reducing capital investment.

With Simplex-LATOX insulation, smaller conduits can be specified for new installations than would otherwise be possible. The capacity of old conduit systems is increased because more conductors can be installed in a given area. Investment in larger conduits can be eliminated or postponed. The additional conduit capacity obtained with LATOX Cables often effects material savings and make it possible to take on additional circuits without additional investment in larger ducts.

Fill in and return the coupon below. It will bring you more complete information.

Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.

Simplex – LATOX

Light wall insulation made directly from rubber latex

Name_____

Company_____

Street_____

City and State_____

EW 2-26

Manufacturing AND MARKETS

Refrigerator Sales Drop in December

Domestic sales of electric household refrigerators during the month of December totaled 101,881 units, valued at $9,275,845, compared with 112,119 units, valued at $9,571,751, in December, 1936, the National Electrical Manufacturers Association has announced. Despite the decline in the closing months of the year, domestic sales for the year totaled 2,203,335 units, valued at $188,974,199, compared with 1,892,378 units, valued at $153,748,132, for the year 1936.

World sales in December, 1937, totaled 113,132 units, valued at $10,209,674, compared with 125,718 units, valued at $10,588,567, in December, 1936. World sales for the year 1937 totaled 2,394,659 units, valued at $203,463,753, compared with 2,067,257 units, valued at $166,564,064, for the year 1936.

•

Orders for Electrical Goods Gain 22 Per Cent Over 1936

New orders booked for electrical goods during 1937, as reported by 78 manufacturers, amounted to $930,170,359, as compared with $763,430,895 during 1936, an increase of 21.8 per cent, according to the Department of Commerce.

Orders booked during the fourth quarter of 1937 were $182,306,350, as against $215,963,847 during the third quarter and $228,061,814 during the fourth quarter of 1936.

•

Decision Upholds Ilg Ventilating Blower Design

In a recent decision by Judge D. J. Hulbert of the New York U. S. District Court the ventilating blower made and sold by Evry-Use Products, Inc., was held to be a Chinese copy of that of Ilg Electric Ventilating Company and the former company is enjoined and restrained from the continuance of the manufacture and sale of the unit.

The decision is regarded as of general interest to all machinery manufacturers because it upholds the manufacturer who establishes a characteristic design and prohibits an infringer from copying that design.

•

N. J. League Plans Exhibit

The Essex Electrical League has reserved a block of 30 booths in the third annual New Jersey National Home Show March 19 to 26 at Newark. Every modern electrical device for home use will be displayed.

•

50-Ton Electric Furnace

A $450,000 improvement program announced by the Timken Roller Bearing Company, Canton, Ohio, will include a 50-ton electric furnace which will increase capacity of output of electric furnace steel to 20,000 tons a month, an increase of 25 per cent.

WestinghouseReports Sharp Business Gain

Notwithstanding the fact that business receded substantially in the latter months of the year, 1937 was an outstanding year for Westinghouse Electric & Manufacturing Company, the company reported.

Orders booked were $229,540,061, as against $182,521,304 in 1936, a gain of 25 per cent. This exceeded orders booked in any year except 1929, when the total was $240,220,555.

Sales billed totaled $206,348,307, as against $154,469,031 in 1936, an increase of 33 per cent, and exceeded only in 1929.

Net income for 1937 totaled $20,126,408, as against $15,099,291, an increase of 33 per cent.

At the beginning of 1938 the company had a large backlog of orders to carry over into the new year, it was reported. These unfilled orders at the end of 1937 totaled $60,298,087, an increase of 24 per cent over the preceding year-end.

PREDICTS BANNER YEAR—Seventeen Hotpoint water heater specialists from all parts of the country recently attended a three-day conference in the Little Theatre of the Edison General Electric Appliance Company, Inc., Chicago. August Jaeger, sales manager, who presided, stated that greater sales activity on electric water heaters is being displayed this year than ever before

GREATEST DIELECTRIC STRENGTH . . . *another high spot in*

TODAY'S TREND TOWARD

PYREX

POWER INSULATORS

PYREX is a Trade Mark and indicates manufacture by Corning Glass Works, Corning, N. Y.

"There's more to lighting THAT meets the eye" . . .

VIRDEN DECORATIVE FIXTURES

perfectly visualize the advantages of FARM HOME ELECTRIFICATION

• *Word* pictures can go far toward selling a Better Light-Better Sight Program along rural extensions, but, after all, "seeing is believing" . . . and *there's* where VIRDEN Decorative Fixtures come in. Scientifically designed to shed soft glareless light, and sensibly styled to add the charm and beauty of which farm folk are becoming increasingly conscious, VIRDEN Equipment sums up in tangible form all the advantages to be had from farm home electrification. Offering quality construction at moderate prices, plus a wide selection of styles and types for every interior, the VIRDEN Line has the added appeal of *real dollar value.*

V VIRDEN VALUE

FULL COLOR ILLUSTRATIONS . . . showing the many series of VIRDEN fixtures as they actually appear alone, and also in typical rooms for which each is especially well suited . . . are included in our new catalog. A copy will gladly be sent you upon request.

JOHN C. VIRDEN COMPANY

• LIGHTING FIXTURES AND PARTS •

SPINNINGS • STAMPINGS • SCREW MACHINE PRODUCTS

6009-6103 LONGFELLOW AVENUE • CLEVELAND, OHIO

T. J. Cope Plans to Merge With Seeger Device Company

Announcement has been made that on March 1 T. J. Cope, Inc., of Philadelphia and the Seeger Device Company of Toledo, Ohio, are merging their interests. T. J. Cope, Inc., is taking over the complete manufacturing and sales management of the Seeger Device Company under the name of T. J. Cope, Inc.

Adolph M. Seeger of Toledo, formerly president of the Seeger Device Company, will become western manager of T. J. Cope, Inc., with offices in Toledo. T. J. Cope, Inc., is this year celebrating its fiftieth year in the field of underground cable installation equipment.

•

Air Units Orders in 1937

Value of orders booked for air-conditioning systems and equipment in 1937 has been estimated by the Department of Commerce at $62,220,055, compared with $45,514,512 in 1936. December orders were estimated at $2,948,246, compared with $3,120,891 in November and $4,399,693 in December, 1936.

•

Oil Burner Shipments Off

Domestic shipments of oil burners during 1937 totaled 187,478, compared with 192,274 during 1936, according to the Department of Commerce. Commercial and industrial units accounted for 14,045 during 1937, as against 13,799 during 1936.

•

Blaw-Knox Enters New Field

Blaw-Knox Company has announced its entrance into the production of equipment for the electro-tinning of steel as well as other continuous electro plating processes through the acquisition of the Electrochemical Processes Company, Youngstown, Ohio, which is to be operated as the Electrochemical Processes Division of the Blaw-Knox Company. J. S. Nachtman will be in charge of the new division, with offices at Groveton, Pa., P.O. Box 1586, Pittsburgh, Pa.

New York Metal Prices

	Feb. 16, 1938 Cents per Pound	Feb. 21, 1938 Cents per Pound
Copper electrolytic	10.00*	10.00*
Lead Am. S. & R. price	4.50	4.50
Antimony	13.75	13.75
Nickel ingot	35.00	35.00
Zinc spot	5.10	5.10
Tin Straits	41.00	42.25
Aluminum, 99 per cent.	20.00	20.00

* Delivered Connecticut Valley.

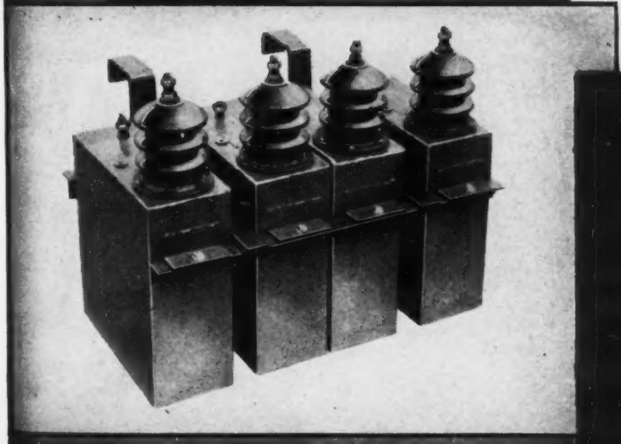
Helping the Utilities Carry Increased Loads

CORNELL-DUBILIER *Capacitors*

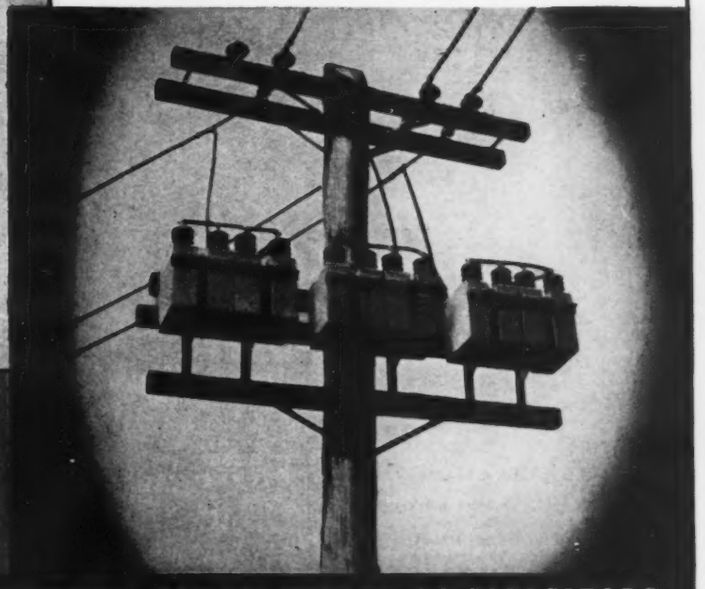
FOR IMPROVEMENT OF LOW POWER-FACTOR ON DISTRIBUTION SYSTEMS

INCREASING pay loads during the past year have forced many utilities to investigate the capacity of their present distribution systems. One of the increasing major "leaks" in distribution system efficiency is poor power-factor. C-D Pole-Type capacitors, designed to improve this condition, enable utilities to obtain more KW capacity at ONE-SIXTH THE COST OF OTHER METHODS OF INCREASING SYSTEM CAPACITY. In addition, capacitors are quickly and economically installed, are easily shifted to meet changing load conditions . . . will increase line voltage, improve voltage regulation, and relieve all apparatus back to the generator of unnecessary rkva.

TODAY! Investigate this low cost method of increasing feeder capacity. Savings alone will pay for the cost of capacitor installation within twelve to eighteen months. C-D field engineering offices throughout the United States will gladly cooperate with you in planning your requirements. Send for Catalog No. 143 today. *Use convenient coupon below.*



2,300, 4,000 and 4,600 volt, one or two bushing 15 kva pole-mounting units on multiple cross arm bracket. Hermetically sealed in weather-proof containers. No further housing required. Inexpensive to install, no maintenance after installation and proven dependability, make the C-D capacitor the ideal power-factor unit.



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Field Reports on Business

Some firming of prices was noted in commodities during the week on encouragement from the Administration. Utility purchases have been slow, but expectations are for better spring business. Electrical appliance sales campaigns are being pushed to offset industrial power losses.

NEW YORK

Trade circles are closely watching developments in the industrial situation for an indication as to the extent the Administration will go to lift prices of some commodities and at the same time keep others at present levels. The firming of some prices during the week was based on the expectancy of further inflation policies believed in the making should business fail to stage a pronounced recovery.

Electrical manufacturers are expecting good business in the appliance field when the new housing program gets under way. Local utilities are backing the plan and promoting the all-electric home idea. In this section the electric companies are sponsoring dealer appliance sales by allowing a discount on purchases based on monthly use of electricity.

A new appraisal of the economic situation is being made by many of the large utility systems in an effort to put construction budgets into effect. The uncertainty of possible future fluctuations in basic commodity prices has acted as a deterrent so far this year. Purchasing departments are caught between the possibility of a further drop in prices and a general upswing. Utilities are being cautioned not to allow themselves to get caught in a buying rush which would mean delayed delivery on needed equipment.

PACIFIC COAST

February seems to be holding its own, and though retail business has lagged it is recognized that real purchasing power is not non-existent as it was five years ago, but is biding its time. The Bonneville output is to be doubled by the installation of two more generators totaling 86,400 kva., cement orders totaling 2,000,000 barrels indicate eventual widespread heavy machinery business and the San Francisco Bay Bridge interurban system has progressed as far as completion of the East Bay yard and lighting standards. Recent business has included $54,000 pumping units for Montana and $25,000 for Los Angeles, six 600-amp. circuit breakers for Tacoma, a $393,571 annual contract by Los Angeles for Moloney transformers and one for $175,000 for Sangamo wattmeters, a $60,000 contract for electric window guards for the government prison at Alcatraz and bids totaling $350,000 and covering motor-driven pumps and air-conditioning material for Mare Island drydocks and containing an unusually high proportion of electrical apparatus.

Line construction material purchasing has been particularly brisk and has been featured by awards covering $37,303 for the construction, $34,114 for the sales, $95,645 for the aluminum wire for the 112-mile 33,000-volt El Centro district system, and 100,000 lb. bare copper wire and $20,000 creosoted poles for the city of Los Angeles. San Francisco exposition business is now approaching its electrical peak with bids requested for eighteen motor trains each of a power unit and three cars, a $500,000 contract each for the Ford and Federal exhibit buildings, and bids to be called for by April for the main distribution system for the grounds.

NEW ENGLAND

Inquiries received during the past week in this district stepped up in volume and thereby reflected a more encouraging trend than has been reported of late. Buying is still scattered over a wide range of electrical equipment and orders are for small lots. Motors are attracting more attention; switch and control apparatus sales are progressing. A 60-cell storage battery with remote control for yard switches will shortly be installed at the Ayer, Mass., substation of the New England Power System. A new 12,500-kva., three-phase transformer with accessory equipment has been purchased for the Comerford station of the system; a 15,000-kva. transformer has been added to the Adams substation.

Activity in the electric furnace field continues and prominent manufacturers in this area are busy completing unusual orders for heat-treating furnaces for foreign installation. One well-known manufacturer records orders for 44 heat-treating units; shop forces will be rushed to complete these furnaces for early shipment. Inquiries from domestic automotive plants relative to new processing electric furnaces are being received in this district.

Merchandise orders are spotty; retailing reports show some lagging in the movement of electrical appliancs; however, inquiries for small lots of refrigerators are noted by one distributor recently; sixteen refrigerators were purchased for replacement in a Boston apartment house; during the past week 22 such units were installed in a Brookline apartment.

CHICAGO

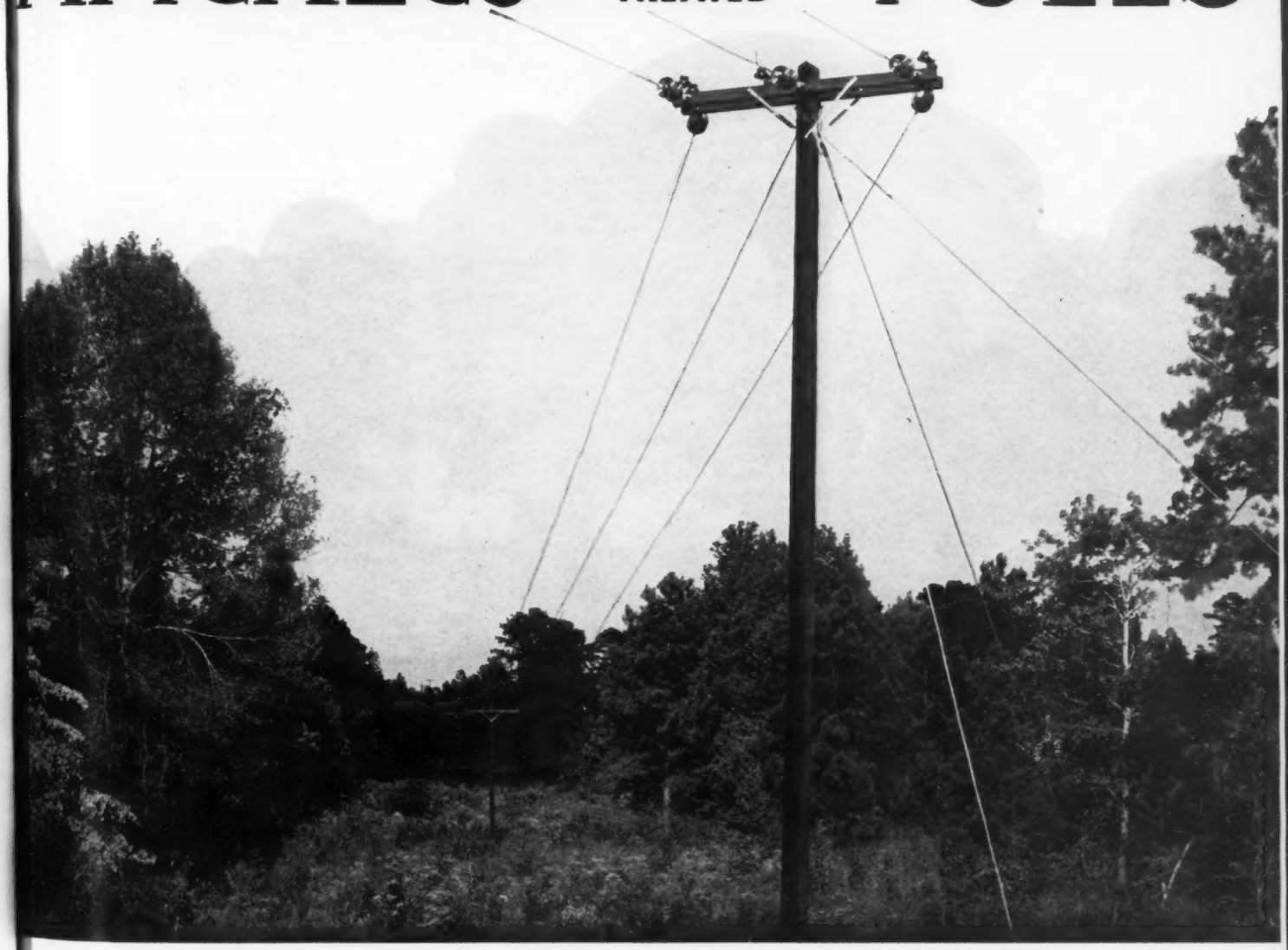
Activity in this area during the past week gave no indication of any immediate improvement over the present condition of business. Sentiment continued to reflect a rather confusing picture, in which uncertainty as to future government policies was an important factor. However, the steady downward trend of raw material prices offers some hope that the resulting lower selling price of finished goods will provide the necessary stimulant to increase buying.

Sales of electrical equipment continue slow, in line with the curtailment of industrial production. The demand for wire lags behind early estimates. There is a fair volume of fractional-horsepower motors being sold. Small transformers and rectifiers are moving. In general, however, orders for the majority of lines of apparatus are relatively slight, in comparison with a year ago.

One important source of electrical business proves to be in remodeling work, particularly stores and theaters. Ten theater and innumerable store jobs of this type are now in progress, with many more still in the planning stage.

Utility purchases are slack and show no inclination to improve before spring.

MODERN LINE CONSTRUCTION
demands the high Quality of
AMCRECO FULL LENGTH PRESSURE TREATED POLES



Near Tylertown, Mississippi

ESTIMATED profits can only be realized on present day electrification projects, if lines are carried by *quality* poles. It is necessary to take advantage of every possible economy in maintenance expense and first cost.

AmCreCo full length pressure creosoted poles assure complete pole satisfaction. They have an admirable reputation of low up-keep cost and long service, which contributes greatly to the economical operation of every line. Because of these outstanding advantages AmCreCo poles have become standard in electrification development where good poles are recognized. Information on request.

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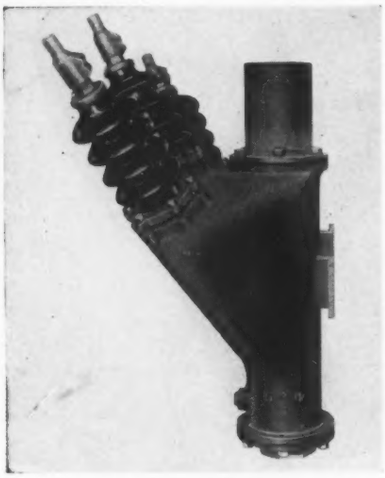
ADDRESS INQUIRIES TO CHICAGO, ILL., OR LOUISVILLE, KY.

New EQUIPMENT AVAILABLE

Outdoor Pothead

Design of this new multiple-conductor pothead is said not only to simplify work of filling with compound, but also to assure that pothead will be completely filled without voids. For compounding, flanged pipe of 5 in. diameter is bolted to top opening. Compound is poured in until it reaches top of pipe, which is level with top of porcelain insulators. When compound has cooled filling pipe is removed and permanent cover bolted on. Shape of pothead is said also to be ideally adapted for grounded structures, since slant of porcelain brings live capnut terminals farther away from mounting structure.

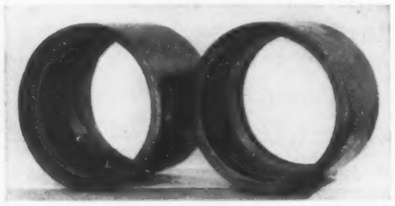


Type "TA" capnut, 3-conductor, 15,000-volt, 500,000-cir.mil, shape "A" outdoor pothead, with detachable porcelain. **G & W Electric Specialty Co.**, Chicago.

•

Fiber Conduit Coupling

This new type of gasketed coupling for fiber conduit is said to require no paint or compound in the joint. It is also claimed that coupling and conduit need not be in alignment and that dirt on conduit at tapered end or on inside of coupling does not prevent conduit from being driven into coupling far enough to make watertight joint. To the standard drive-joint coupling have been added two cork gaskets set in annular grooves near outer ends of coupling and projecting slightly into the same. As conduit is driven into coupling, cork is compressed and watertight joint secured.

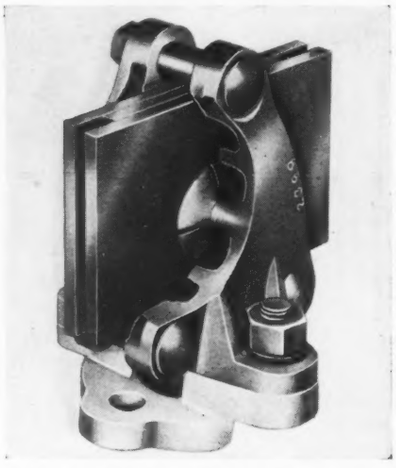


Tapered sleeve joint used in "watertight" fiber conduit construction, showing machined groove (right) and cork gasket in place (left). **Brown Co.**, New York, N. Y.

•

Slide-Fit Bus Clamps

To combat bus expansion, new slide-fit bus clamps suspend the bus between phosphor-bronze spring washers. This is said to permit unlimited longitudinal movement of bus without permitting 60-cycle vibration and to prevent side-slapping under short-circuit conditions. Spacers over bolts control spring pressure and freedom of bus movement. Clamps may be employed through length of bus run or used in combination with anchor type clamps located at points along the bus.



Slide-fit bus clamp for rectangular bus; also offered for bars, tubes, channels and angles. **Memco Engineering & Mfg. Co.**, Long Island City, N. Y.

•

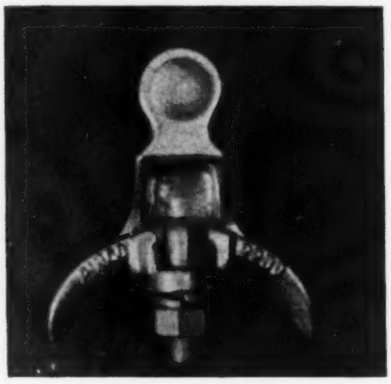
New "Megohmer"

Model "DM" Megohmer; megohm ranges, 0-50 and 0-100; voltage ranges, 0-240 and 0-600 a.c. and d.c. **Herman H. Sticht & Co.**, New York, N. Y.

This company's "Megohmer" has been redesigned so that it may be used as a portable voltmeter on both a.c. and d.c., with a range of 600 volts. Device features a 500-volt generator for use in making insulation resistance measurements from 0-100 megohms, has extra binding posts for measuring a.c. and d.c. voltages.

Angle Clamp

New angle clamp for use on all angles up to 120 degrees has no loose parts, features a side opening design and is said to be easy to install and ideal for hot line work. Self-locking keeper bolt holds conductor securely in place. Approved for all types of conductors, clamp can be used on conductor sizes up to 6/10 in. in diameter.

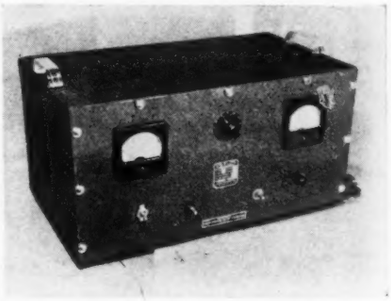


Angle Clamp No. 2260. **The Porcelain Insulator Corp.**, Lima, N. Y.

•

Rectifier Power Unit

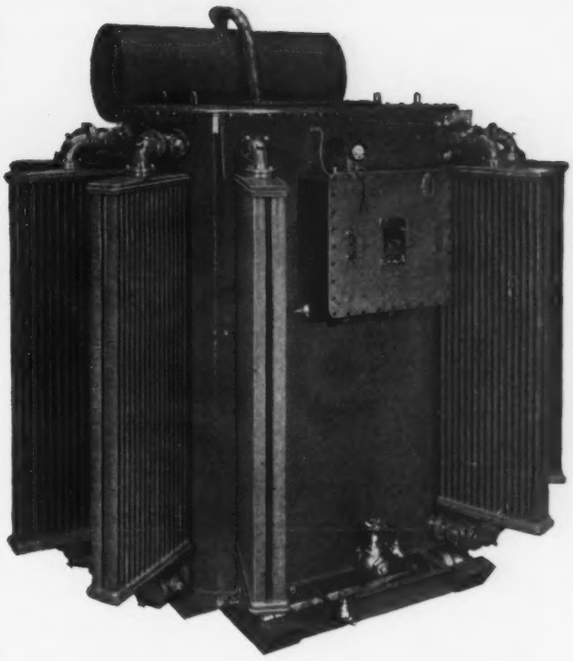
This new power unit is said to be, in effect, a tapped d.c. transformer, circuit being one in which number of rectifying junctions in use is adjusted in accordance with desired d.c. voltage. By means of a switch, both transformer secondary voltage and rectifier connections are changed to give optimum conditions for each d.c. output voltage. This effect is said to be especially desirable for such applications as brush electroplating, in which voltage



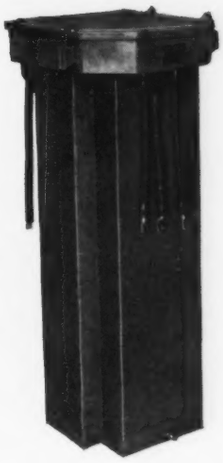
Rectifier power unit; will deliver from 15 to 20 amp. for intermittent use, has seven voltage steps from 1½ to 18 for plating with different metals and electrolytes. **B-L Electric Mfg. Co.**, St. Louis, Mo.

SCOPE

You can have AmerTran transformers for every requirement . . .



Above: AmerTran Power Transformer — available in sizes from 501 to 10,000 Kva. and for potentials up to 132 Kv.



Left: AmerTran Distribution Transformer—available in sizes from 1½ to 500 Kva. and for potentials up to 73 Kv.

Left: AmerTran Air-Cooled Transformer—available in sizes from 0.05 to 100 Kva. and for potentials up to 30 Kv.

Ask about these

FEATURES

1. High turn-to-turn insulation.
2. Linear surge-voltage characteristics.
3. Fully balanced coil design.
4. Coils vacuum impregnated.
5. Rigid core construction.
6. Optimum impedance characteristic.
7. Tanks pressure tested.
8. Electrically brazed connections.
9. External parts rust resistant.

WHETHER you plan to supply power for some large industrial project or have need of a special voltage for experimental work, AmerTran is fully equipped to furnish transformers for the purpose. Equipment regularly furnished to both electric utilities and all branches of industry during the past 37 years includes not only all standard ratings but also special units for almost every conceivable application, including testing, heating, welding, precipitation, plate and filament supply and electric control. All types and sizes are characterized by good workmanship, rugged construction, attractive appearance and careful attention to details—developed through long experience. May we submit data on transformers for your needs?

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A "Hartford" inspector making a periodic "Megger" test on electrical equipment insured by them. (Photo by Courtesy of The Hartford Steam Boiler I. & I. Co. and Girard Trust Co. Bldg., Philadelphia.)

New "MEGGER" Catalog

Our new "Megger" Catalog—just issued—describes the most complete line of instruments ever offered for testing electrical insulation resistance. It tells just what the "Megger" instruments are—the various types that are available—and why they are so widely used for testing practically all types of electrical equipment. It describes, illustrates, suggests—is dedicated to the detection and prevention of trouble.

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ELECTRICAL INSTRUMENTS

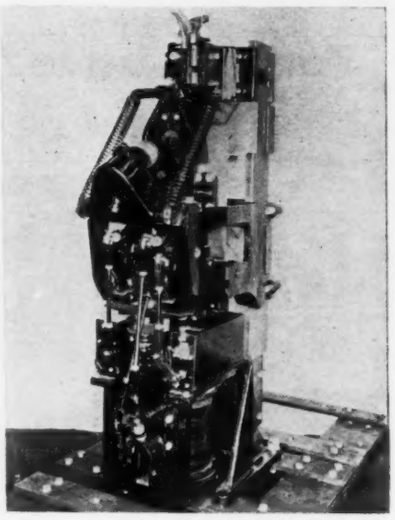
1211-13 ARCH STREET PHILADELPHIA, PA.

should not fall rapidly with increased load. Small fan, driven by an induction type motor, provides for cooling of rectifier and transformer.

•

Air Circuit Breaker

Contacts of this heavy-duty d.c. air circuit breaker are said to represent a wide departure from previous practice in circuit breakers of this type. No carbon is used and main and auxiliary contacts are so arranged that magnetic reaction at high currents increases contact pressure. Main



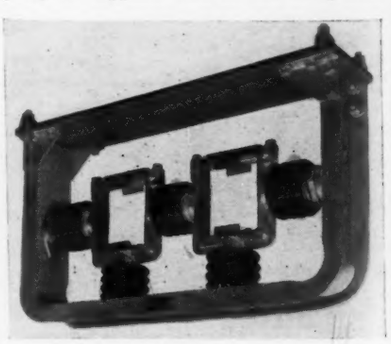
Heavy duty d.c. air circuit breaker; single-pole types for pedestal or panel mounting in current ratings from 2,000 to 10,000 amp. up to 750 volts. **Westinghouse Electric & Mfg. Co.,** East Pittsburgh, Pa.

contacts have stationary portions semi-flexible, while moving contact is solid. Thus magnetic reaction set up by heavy currents forces stationary contact outward against moving contact, thereby maintaining contact pressure until breaker actually starts to open. It is claimed that heavy currents may be interrupted repeatedly without requiring maintenance on any of contacts.

•

Heavy-Duty Bus Support

Two sets of twelve 6 x ¼-in. bars with wide spacings between groups of six each are carried on wet process insulators in compression in this d.c. bus support. Clamps are provided with rollers and springs permitting bus expansion and contraction. Adjusting nuts between frame and end insulators are said to insure rigidity of supports without use of spacers.

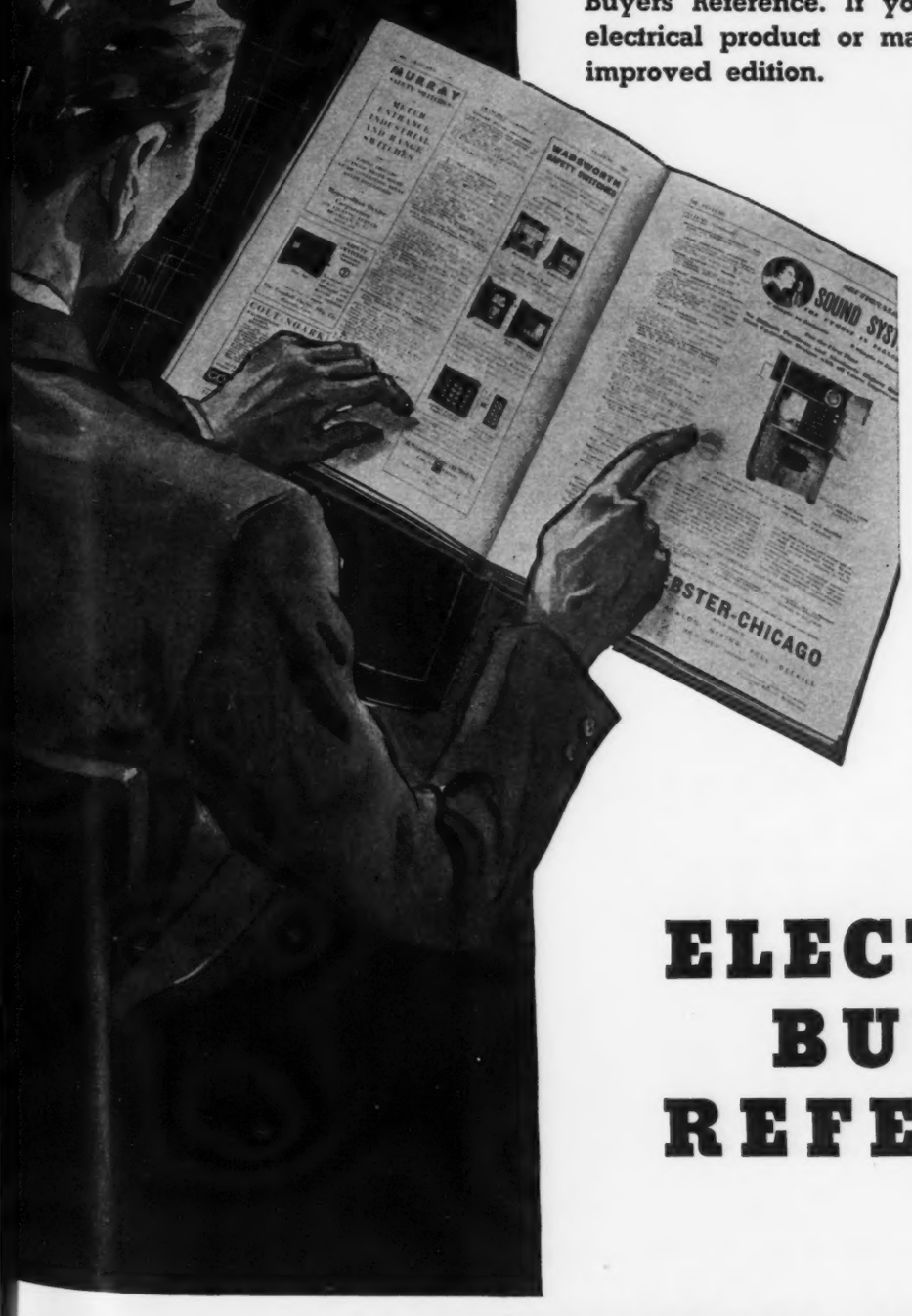


Steel mill bus support. **Delta-Star Electric Co.,** Chicago, Ill.

SAVE

Time and Money With This *Electric* Buyers Reference

A wealth of handy buying information that will make your work easier is included in the 1938 Electrical Buyers Reference. If you want information on any electrical product or manufacturer, look first in this improved edition.



For Example:

Want to know who makes Switches? Just turn to the S's in this section and you will find a complete list of switch manufacturers plus descriptions of the individual makes in many cases.

Trying to locate a product with trade name "American"? A simple reference to the alphabetical tabulation of trade and company names (page 351) will locate the product for you immediately. Remember, if you want quick information on any Electrical Product or Manufacturer, look first in

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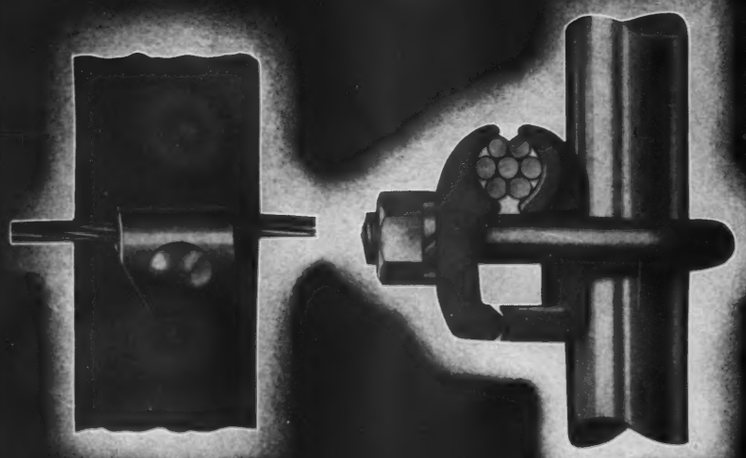
for
SAFETY IN GROUNDING

TYPE GH

TYPE GA



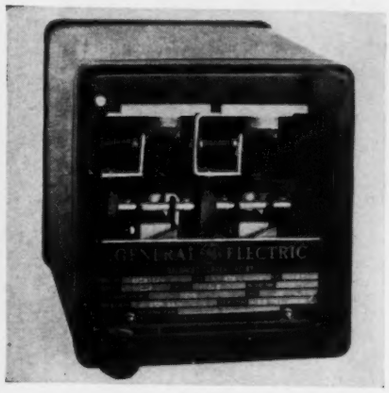
TYPE GB

TYPE GR

BURNDY
ENGINEERING COMPANY, INC.
459 EAST 133d STREET · NEW YORK

Current-Balance Relays

Electric targets replace mechanical targets previously used on this company's high-speed, current-balance relays for protection of parallel lines against phase-to-phase faults. Electrically operated targets have the advantage of avoiding indication unless relay actually accomplishes its function by closing of its contacts and passing tripping current through target coils. To assure that target of protective relay will drop when relay functions, a small spring latch has been added to relay to catch armature in operated position.

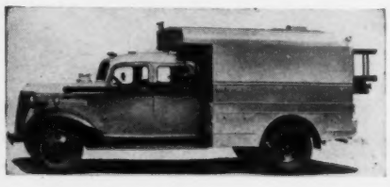


"Type RDC" current-balance relay. **General Electric Co.**, Schenectady, N. Y.

•

All-Steel Line Body

All-steel body, telescoping roof and a rubber goods compartment that extends well out over the cab to provide more room in the body itself are features of this new line body. Ladders, pike poles and derricks are inclosed within the body. Built into the roof of the five-man crew cab is a hatch which is opened to serve as an emergency exit if the cab tips over on its right side and also serves as a ventilator if needed. Compartment doors are the company's watertight type.



"Model 1480" Baker all-steel line body; length, 102 in.; mounted on Chevrolet 1½-ton chassis. **Baker-Raulang Co.**, Cleveland, Ohio.

•

Sheet Metal Shear

"Lectro-Shear;" powered with universal motor, 110 volts standard voltage; uses three-wire cable. **Black & Decker Mfg. Co.**, Towson, Md.

Sheet metal fabricators should be particularly interested in a new portable electric shearing tool. Shearing action is accomplished by rapid reciprocating action of a vertical blade against stationary horizontal blade set in a special shoe which is said to indicate the correct cutting angle and to adapt the tool to all types of cutting work. Makers claim it will cut up to its rated capacity—16- or 18-gauge—in steel, galvanized iron, monel metal and stainless steel and at least 50 per cent above rated capacity in copper, tin, aluminum, lead and other non-ferrous metals.

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...AND THE *New* HEMINGRAY SERIES-600 WILL CONFIRM THE DECISION

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TYPE 660—FOR VOLTAGES UP TO 8,000
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Handle most PRIMARY line requirements

FOR MODERN POWER LINE INSULATION

Order HEMINGRAY Glass INSULATORS

Many people know the Bell System policy, "To render the best possible telephone service at the lowest possible cost consistent with financial safety." I believe it may interest them to learn how Western Electric helps in the fulfillment of this policy.

PRESIDENT

A financial statement without figures

In the Bell System, the manufacture, purchase and distribution of equipment are centralized in one organization—Western Electric Company.

From these large scale operations, important economies have resulted, and have made possible repeated reductions in Western Electric prices to the Bell Companies, even in times when the general price trend has been upward.

Western Electric's established policy is to set the lowest prices consistent with fair wages to its employees, a fair return on the money invested in the business, and the maintenance of the Company's financial stability.

The proof that this policy has been observed is that for the past twenty years the Company's rate of return on its investment has averaged less than seven percent.

Western Electric

BELL SYSTEM SERVICE
IS BASED ON
WESTERN ELECTRIC QUALITY

Lamp Dimmers

"Autrastat;" two sizes, 1,000 and 4,000 watts maximum capacity; for use on 110-120 volts, 50-60 cycle a.c. **Ward Leonard Electric Co.,** Mount Vernon, N. Y.

Smooth flickerless dimming and greater flexibility in loading are claimed features of this new dimmer, which has the characteristics of an autotransformer with an infinite number of steps. Makers state that it will control any load from 10-watt lamp up to its maximum rating with equal facility and same rate of change in intensity; at any position, connected load may be increased or decreased without affecting the intensity. Low losses of dimmer make for minimum heat dissipation.

•

Multi-Tap Connector

This special device is offered for making connections between service drop pigtails and main secondary conductors in alley distribution where several drops run from one pole. One size accommodates a No. 2 line wire and six No. 6 taps in a close-fitting slot that assures dependable connections.

Multi-tap connector. **Reliable Electric Co.,** Chicago, Ill.

•

Underground Cable Tools

Roller bearing swivel, for use in 3-, 3½- and 4-in. conduits, and utilities, splicing wrench. **B. S. Barnard & Co., Inc.,** 123 Lafayette Street, New York, N. Y.

Two cable tools recently announced by this company are a roller bearing swivel and a utilities' splicing wrench. The swivel, used to prevent twisting of cables being drawn in through underground conduits, is said to be capable of withstanding a pressure of 10,000 lb. The splicing wrench, used to press together split connectors and collars in splicing underground cables, operates also as a quick-acting adjusting wrench for installing interior iron conduit.

•

Dew-Point Potentiometer

Dew-point potentiometer; temperature range, 130 to minus 40 deg. F. **General Electric Co.,** Schenectady, N. Y.

Portable dew-point potentiometer is offered for use in determining the moisture content of atmosphere in industrial metal-heat-treating furnaces. It consists of a polished, metallic mirror, so located in a small chamber that it can be seen through a sight glass, and means for cooling mirror and reading its temperature. Gas to be tested is passed continuously through chamber and, as temperature of mirror is lowered by jet of carbon dioxide or some other storage gas directed against back of mirror, a spot of dew appears when dew-point temperature is reached.

Municipal Plants

ALBANY, N. Y.—Mayor Thacher will ask the federal government to grant his city sufficient funds for construction of a municipal power and light plant. Declaring that revenue from such a plant could be applied directly to reduction in cost of government, the mayor made known his intentions recently before leaving for the south. "Before I return," the mayor said, "I plan to see Secretary Ickes and discuss the possible financing of a municipal power plant through a grant of Federal funds. The two purposes I have in mind are reduction in power and light rates and a reduction in taxes due to earnings of a municipal plant. In other words, I feel the plan can be financed without burden to the taxpayers and benefits would accrue in reduction of rates and reduction in real estate taxes, and the latter, in my opinion, is an important matter."

HIGH POINT, N. C.—For the purpose of clarifying certain phases of the opinion, written by Associate Justice Winborne and concurred in by all other justices, in which a lower court decision denied plaintiffs an injunction against the proposed $5,776,750 PWA financed hydro-electric power plant, this city will petition the North Carolina Supreme Court for a rehearing on the suit brought by the Duke Power Company and J. Paul Williamson to enjoin a municipally owned power plant on the Yadkin River.

SANDUSKY, OHIO—Five-year battle between this city and the Ohio Public Service Company on the question of building a municipal light plant with a proposed $1,500,000 bond issue, was ended recently when Judge E. H. Savord granted a permanent injunction in favor of the utility, restraining the city from building the plant. Public sentiment, expressed at election time, was reversed during the five year period. Electors in 1933 indorsed overwhelmingly a proposal to build the municipal plant, and litigation immediately began. The district court of appeals upheld the utility's contention that the election was illegal, because the city commission had failed to comply with a city charter provision to prepare complete plans for the plant before the bond issue was submitted to voters. By last November, when an amendment to the charter which would make possible another vote on the issue was submitted to voters, sentiment had changed and the proposed amendment was defeated. Voters also elected a majority of city commissioners who were unfavorable to the project. The permanent injunction granted last week followed dismissal of the case by the Court of Appeals on consent of both parties.

NELSONVILLE, OHIO—Access to the records of the municipal electric plant was recently ordered by Common Pleas Judge O. F. Rowland in the litigation between the city and the Southern Ohio Electric Company over the right of the municipality to issue $90,000 in bonds to improve the city owned electric system. Company officials said the city had refused access to the books.

LEWISBURG, TENN.—Suit in which the Tennessee Electric Power Company sought to enjoin the city from constructing a municipal distribution system has been dismissed with the power company paying all costs of litigation.

LENOIR CITY, TENN.—City officials have made plans to negotiate a contract with TVA for power to be distributed by a municipally owned system, which would be built with PWA funds and a $32,000 bond issue authorized early this month.

PROVO, UTAH.—Briefs supporting a petition for rehearing in the municipal power plant case have been filed in the state supreme court by the Utah Power & Light Company. In an opinion handed down on December 31 the court upheld the legality of ordinances under which the city proposes to finance and construct the plant and refused to grant the power company's plea for a writ permanently to restrain the city. In its recent brief the power company contends the court erred in holding that the procedure followed was authorized by statutes enacted prior to the Granger act; that it erred in holding the bond and construction ordinances comply with the special fund doctrine and do not involve the general credit of the city. Further contention is that the court erred in "failing definitely to announce that in no event can Provo as a city fix rates for power furnished to itself sufficient to make up any deficit in the light and power fund necessary to pay operating or maintenance costs or principal or interest on the bonds."

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Recent Rate Changes

BIRMINGHAM ELECTRIC COMPANY has reduced its residential electric rates $100,000 a year under the terms of a new schedule filed with the Alabama Public Service Commission. Marking another step-down in its "objective rate" plan, whereby rates drop periodically as consumption goes up, the new reductions lops a half-cent off the utility's top rate of five cents per kilowatt hour for electricity used in homes. The reduction will save the individual consumer up to 40 cents a month on his electric bill. It is the fourth top rate reduction to become effective since Birmingham Electric adopted the "objective plan" in 1935.

CENTRAL NEW YORK POWER CORPORATION has been ordered by the state Public Service Commission to reduce temporarily electric rates $300,000 a year. The reduction will affect mainly industrial and commercial consumers in Syracuse and Cortland and in many smaller communities adjacent to those cities. The new rates will become effective March 1. Of the reduction ordered about $275,000 will be applicable to commercial consumers and the remainder will affect residential customers in Cortland and in other communities outside the city of Syracuse.

WISCONSIN PUBLIC SERVICE COMMISSION has announced that reductions totaling $1,174,472 in electric rates were ordered for Wisconsin users in 1937.

OHIO PUBLIC UTILITIES COMMISSION has announced that utility rate reductions in Ohio produced annual savings of $3,806,604 for consumers in 1937. Electric light cuts accounted for $1,794,813 of this total.

MANITOWOC, WIS., will save $28,000 annually on its electric light and power bill as the result of reduced rates recently voted by the common council. The schedule has been sanctioned by the state Public Service Commission.

WACHUSETT ELECTRIC COMPANY'S new schedule of rates, which became effective February 1, has been found agreeable to customers who petitioned the Massachusetts Department of Public Utilities for reduction in rates. As a result, the petition has been dismissed. The new schedule will save residential and commercial customers about $12,500 annually.

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News ABOUT PEOPLE

Engineering Council Names Dr. McClellan President

William McClellan, president of the Potomac Electric Power Company, Washington, D. C., was recently elected president of the American Engineering Council for the two-year period 1938-1939. Dr. McClellan is widely known as an educator and engineer.

Following graduation from the University of Pennsylvania, he joined the teaching staff and later became dean of the Wharton School of Finance and Commerce of that University. From 1900 to 1904 he worked in various capacities for the Union Traction and Philadelphia Rapid Transit Company besides his regular teaching duties. In 1904 he engaged in New York in design work for Westinghouse, Church, Kerr & Company on the lighting and

power distribution for the Pennsylvania Railroad terminal.

From 1907 until 1917 he was vice-president of the Campion-McClellan Company and in the latter year became a member of the firm of Paine, McClellan and Campion. From 1919-21 he was vice-president of the Cleveland Electric Illuminating Company. In 1922 he became a member of McClellan and Junkersfeld, remaining in that firm until he was elected vice-president of the Stone & Webster Engineering Corporation in 1929. At present he is president of William McClellan & Company, Ltd. Dr. McClellan is a past-president of the A.I.E.E.

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▶ L. G. TIGHE, vice-president of Ohio Edison Company, has been named to the board of directors of Akron University.

▶ L. L. RAY has joined the staff of the Duke Power Company in the capacity of agricultural engineer. Mr. Ray will assist rural customers of the utility, individually and in groups, in applying electric service to their respective operations.

▶ W. W. CALDWELL, has resigned from the J. G. White Engineering Corporation to become vice-president and general manager of the building construction firm of Iglehart, Caldwell & Scott, Inc., New York.

▶ H. J. HOFFMAN has been appointed manager of the special products division recently formed as a result of the reorganization of the manufacturing facilities of the Westinghouse Electric & Manufacturing Company at Bloomfield, N. J. The new division embraces the design, manufacture and sale of electronic tubes, according to announcement of D. S. Youngholm, vice-president.

▶ GEORGE A. WIEBER, since 1936 manager of the northern division of New York Power & Light Corporation with headquarters in Glens Falls, has been appointed manager of the Utica district of the Central New York Power Corporation. In this position, Mr. Wieber has supervision over all electric and gas operations in the Utica area. The assignment to Utica takes Mr. Wieber back to familiar territory, for he was connected with the former Utica Gas & Electric Company from 1919 to 1929. He had previously been connected with the Westinghouse Electric & Manufacturing Company and the New York Edison Company. He had resided in Glens Falls since 1931.

R. W. Ferguson Elected Head of Porcelain Companies

Robert W. Ferguson has been elected president of the Star Porcelain Company and the Frenchtown Porcelain Company at the recent annual meeting of the board of directors. Mr.

Ferguson entered the employ of Star Porcelain Company as an office boy twenty-two years ago, and rose through the various positions of cost clerk, payroll clerk, factory superintendent, vice-president and assistant general manager in charge of sales to his present office of president and general manager.

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▶ SAMUEL E. MILLER, secretary-treasurer of the Monongahela West Penn Public Service Company since 1929, has retired. He had been associated with the company for more than 20 years. The election of GARRETT J. JACKSON, assistant secretary, as secretary, and O. F. LOUGH, vice-president, as treasurer has been announced. Ill health, which has kept him from his duties much of the last two years, caused Mr. Miller to relinquish his position. He is now in Florida.

▶ G. W. VINAL, physicist and chief of the section of electrochemistry, National Bureau of Standards, Washington, D. C., has been awarded the

Gaston Planté Medal of the Société Française des Electriciens. This is the initial award of this medal. The award will be made every three years, accompanied by a sum in cash of 4,000 francs, to any person who will bring an important contribution to the industry of electric storage batteries, photo-voltaic cells, or electrochemistry in general.

▶W. Neal Gallagher, president of the Automatic Washing Machine Company, Newton, Iowa, has been elected president of the American Washing Machine Manufacturers' Association. He is succeeding C. G. Frantz who has held that office for three years.

▶Clark H. Minor, president of the International General Electric Company and a director of thirty-two other corporations, made his debut as an artist this week when a dozen statuettes and bas-reliefs executed by him went on public exhibition at the Studio Guild, New York. Mr. Minor, who is 59 years old, has been actively associated with the electrical industry since he was graduated from Hamilton College in 1902, and since 1925 has been president of the International General Electric Company.

▶Robert L. Hamilton has been appointed sales manager of the Dumore Company, Racine, Wis. In his new capacity, Mr. Hamilton will fill the vacancy caused by the resignation of Leland B. Augustine, who has been sales manager for several years past. Mr. Augustine will take personal charge of Dumore sales in the Chicago territory. Mr. Hamilton became advertising manager for Dumore in 1934 and in 1936 he was assigned the added position of sales promotion manager. With the three-fold portfolio brought by the present promotion it is expected that there will be closer correlation of activity in these departments.

▶George Campbell, manager of the Schenectady local sales office of the General Electric Company, has assumed the added responsibilities of the management of the Syracuse office. The combined Schenectady and Syracuse territories include all of New York state and Susquehanna, Bradford and Tioga counties in Pennsylvania, except the metropolitan New York and Buffalo areas. Mr. Campbell succeeds A. J. Hornsby in the Syracuse area, who retired on December 31 after 38 years of service with the company.

▶L. W. Shugg, publicity department, General Electric Company, has been re-elected president of the Exhibitors Advisory Council, Incorporated, at the recent annual meeting of the directors in New York City. Other officers elected to serve during 1938 are: Vice-president, S. A. Knisely, Republic Steel Corporation; secretary, E. A. Phoenix, Johns-Manville Corporation; treasurer, R. H. DeMott, SKF Industries, Inc. Mr. Shugg entered the employ of the General Electric Company in 1902.

"FOR DISTINGUISHED ACHIEVEMENT"—Henry L. Doherty, president of the Cities Service Company, received last week the Anthony F. Lucas Medal, given annually by the American Institute of Mining and Metallurgical Engineers. The presentation was made at the annual dinner of the institute at the Waldorf-Astoria Hotel, New York

▶George J. Helling has been appointed resident manager of the Schenectady district of the New York Power & Light Corporation, to succeed Ray Timmerman who was transferred to the general commercial department at Albany. Mr. Timmerman, who has had many years of experience in both operating and commercial branches of the industry, will be engaged in special studies relating to the commercial operations of the company. After sixteen years with the Utah Power & Light Company, he joined the former Adirondack Power & Light Corporation in 1924, serving as manager of the northern district, later at Watervliet, and when New York Power & Light Corporation was formed at Albany. He was transferred to Schenectady in 1935. Mr. Helling's service with New York Power & Light and its predecessor companies goes back thirty-one years.

OBITUARY

▶Matthew Hutchison, who retired as head of the municipal lighting department at Victoria, British Columbia, three years ago, after forty years of service, died recently in Victoria at the age of 71.

▶Stanley G. Hatto, an electrical engineer with the Puget Sound Power & Light Company, and an active member of the Electric Club of Washington, died suddenly at his Seattle home February 2.

▶Herbert I. Lee, supervisor of overhead poles and lighting for the United Illuminating Company, New Haven, Conn., died January 10, of a heart attack, in his sixty-sixth year. A native of Worcester, Mass., Mr. Lee had conducted an electrical business of his own prior to his connection with the United Illuminating Company 22 years ago.

▶Eugene R. Carichoff, retired General Electric Company engineer, and winner of the Charles Coffin Foundation award for outstanding engineering work, died at Schenectady, N. Y., January 31. He was 77 years of age. Mr. Carichoff joined the General Electric Company in 1907 and retired in 1930.

▶J. Harold Paget, manager of engineering and operation for the Carolina Power & Light Company, Raleigh, N. C., died in Sanford February 2, after a brief illness. Mr. Paget had been connected with Carolina Power & Light for twelve years. Before going to North Carolina Mr. Paget had been associated with the General Electric Company, California Gas & Electric Company and electric companies in Vancouver and Mexico City.

▶William M. Joy, electrical engineer, Electric Bond & Share Company, New York, died, of pneumonia, February 5 after a brief illness in his home at Montclair, N. J. He was 60 years old. A graduate of Tufts College, Massachusetts, he began his engineering career with the Boston Elevated Railway Company, subsequently spending several years abroad in his profession in Trinidad, British West Indies, and in Porto Rico. In 1911 he joined the engineering staff of Electric Bond & Share Company and associated companies in New York, where he was actively engaged up to the time of his death. He contributed to the engineering design of many important electric power stations in the United States and in foreign countries. Mr. Joy was a member of the American Institute of Electrical Engineers.

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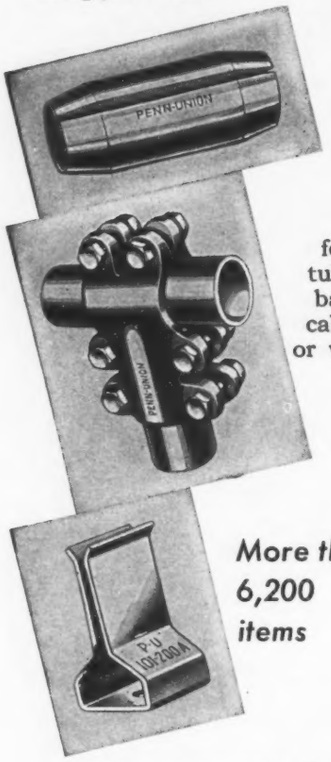

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Sales Opportunities

PUEBLO, COLO.—Southern Colorado Power Company plans extensions in transmission and distributing lines in different parts of territory, including additions to rural electric system, power substation and service facilities. Cost estimated over $150,000. Work will be carried out as part of 1938 expansion program.

NEW HAMPTON, IOWA—Has preliminary plans for extensions and improvements in municipal electric power plant, including installation of additional generating and auxiliary equipment. Cost close to $175,000. Richard E. Lutz, Minneapolis, Minn., is consulting engineer.

HARTSELLE, ALA.—Will take bids soon for primary and secondary lines for municipal electrical distribution system, including transmission line for connection with TVA system and power substation facilities. Lide & Adler, Woodward Building, Birmingham, Ala., are consulting engineers.

WHITE PIGEON, MICH.—Eddy Paper Corporation, Three Rivers, Mich., has authorized new power plant at branch paper mill at White Pigeon. Fund of $300,000 is being arranged for building and equipment.

YONKERS, N. Y.—Refined Syrups, Inc., 120 Wall Street, New York, N. Y., plans installation of motors and controls, regulators, transformers and accessories, conveyors and other equipment in new mill at Yonkers. Company has purchased part of former refinery of Spreckles Sugar Corporation and will remodel and modernize for plant. Cost about $800,000.

NORTH PLATTE, NEB.—Platte Valley Public Power & Irrigation District plans extensions in transmission and distributing lines in different parts of territory, with outdoor power substations and service facilities. Fund of about $1,000,000 has been secured through Federal aid for this and other expansion in plants and system.

BOSTON, MASS.—Massachusetts General Hospital, 1 Federal Street, plans installation of motors and controls, regulators, electric elevators, air-conditioning and other equipment in new 15-story hospital unit on Fruit Street. Work is scheduled to begin in the spring. Cost about $2,500,000. Coolidge, Shepley, Bulfinch & Abbott, 1 Court Street, Boston, are architects.

GREENWOOD, S. C.—Greenwood County Finance Board receives bids on or about March 15 for power dam, power house and spillway for new county-owned hydroelectric generating plant at Buzzard Roost. All bids for equipment received a number of months ago have been rejected with exception of that for electric generators, awarded to General Electric Company at $325,168. New bids will be asked soon for hydraulic turbine units and other power station equipment, penstock, trash racks, tainter gates with hoists, electric traveling crane and miscellaneous equipment. E. L. Brooks is chairman.

COURTLAND, ALA.—Has authorized surveys and estimates of cost for new municipal electric power plant. Financing will be arranged closely following. J. M. Gilfillan & Associates, Inc., 1425 South Twenty-eighth Street, Birmingham, Ala., is consulting engineer.

MERRILL, WIS.—Wisconsin Public Service Corporation, Green Bay, Wis., will award contracts soon for power house substructure, earthwork, intake structures, pipe line supports, surge tanks and other construction for proposed new hydroelectric generating plant at Grandfather Falls on Wisconsin River, vicinity of Merrill. Station will be equipped for capacity of 17,500 kw. Work is scheduled to start in spring on new 66,000-volt transmission line from station site to Wausau, Wis., about 32 miles, with power substations and switching stations. Entire project will cost about $1,600,000.

SAN FRANCISCO, CALIF.—Coca-Cola Company, 310 North Avenue, N. W., Atlanta, Ga., plans installation of motors and controls, regulators, electric hoists, conveyors and other equipment in new multi-story beverage and bottling plant near Third Street and Carroll Avenue, San Francisco, where site has been acquired. A power house will be built. Cost about $1,000,000. Proposed to begin work in spring. Pacific Coast division offices of company are at 963 East Fourth Street, Los Angeles, Calif.

CORONA, L. I., N. Y.—Interboro Rapid Transit Company, 165 Broadway, New York, N. Y., has approved plans for new power substation at power house on Roosevelt Avenue, Corona, and will proceed with work at early date. Cost over $80,000 with transformers, switchgear and accessory equipment.

MCKINNEY, TEX.—Grayson-Collin Electrical Co-operative, Inc., McKinney, S. G. Taylor, president, plans early purchase of power substation equipment, including transformers, switchgear and accessories. Appropriation is being arranged. Connection will be made with lines of Texas Power & Light Company, which will furnish power for rural electric system of first noted organization.

WISCONSIN DELLS, WIS.—Plans construction of transmission line to Lewiston, where power service will be furnished from municipal electric plant. A power substation will be built at latter place.

BLYTHEVILLE, ARK.—Swift & Company, Union Stock Yards, Chicago, Ill., plans installation of motors and controls, conveyors, loaders and other equipment in new cottonseed oil and soy bean oil mill at Blytheville, where site is being selected. A power house is planned. Cost close to $450,000.

HOUSTON, TEX.—Has plans under way for new two-story central fire alarm station on Lamar Street and extensions in fire alarm system in different parts of city. Cost about $350,000, of which station unit will represent approximately $75,000, with equipment. Bids are scheduled to be asked soon. R. F. Taylor, Bankers' Mortgage Building, is electrical engineer.

CHATTANOOGA, TENN.—Electric Power Board, Municipal Building, receives bids until March 14 for 11 transformers for installation in 44,000-volt power substations Nos. 1, 3 and 6, stepping down voltage to 13,000-volt, with auxiliary equipment. Harold C. Fiske is chairman (Sub-Project—Contract No. 3-A). (Cost estimated about $105,000). Also, receives bids until March 7 (changed from March 4), for 44-kv. transmission lines, including aerial line across Tennessee River.

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Exchange Offer Extended

Commonwealth Edison Company has announced indefinite extension of its offer to exchange its common stock for preferred shares of the Western United Gas & Electric Company and the Illinois Northern Utilities Company.

Cooler Buses With Vents

[*Continued from page 43*]

The front of the compartment was either alberene slabs or transite safety doors.

Tests included runs to determine the benefits of natural ventilation of the cell structure. Two-inch holes on 4-in. centers were drilled at the top and bottom on the lower phase; 2-in. slots were cut at the top and bottom of the upper phase, all at the rear of the structure, as shown in Fig. 1. The test at 3¼-in. spacing was then repeated. This resulted in a very material drop in both copper and cell air temperatures. The gradient in air temperature in the ventilated cells was several degrees less than that in unventilated cells.

The upper cell temperatures were higher than those in the lower cell by several degrees and are those shown in the curves, except in the case of the horizontal arrangement of ¼ x 4-in. bars which were tested in the lower cell only. Although the iron half of the insulator clamp was erroneously put on the outside of the bars when assembling the test, the bars under the insulator clamps ran a maximum of only 1 deg. hotter than other portions of the bus, while the upper edges of the clamp ran several degrees cooler. Bolted splices ran cooler than the rest of the bus. Other tests show that painting the bars a dull black materially decreases the operating temperature, and shot blasting the bars before painting still further decreases it.

Increasing the height of the slots above 2 in. proved to be of little benefit, and there was little difference between results obtained with holes and with slots. Other tests have shown that slight benefits may be obtained by placing the lower slots in the front of the structure, the upper slots in the back, or vice versa. This apparently caused a draft across the copper that scours the hot air out of the structure more thoroughly than when both slots are on the same side of the cell.

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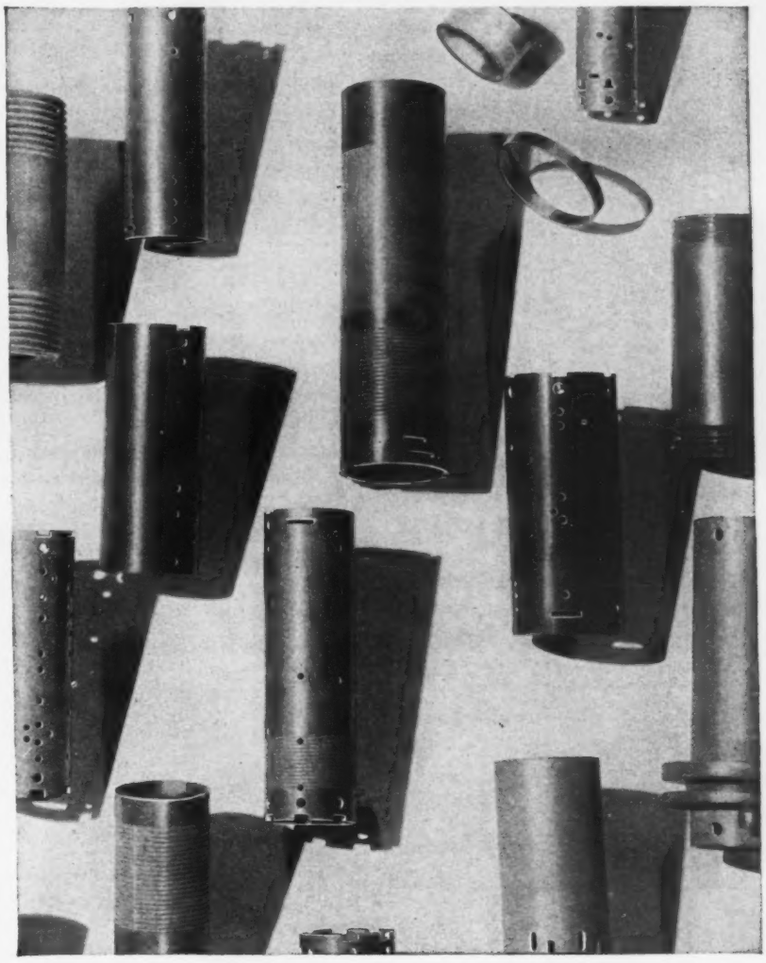
Cleaner Sales Set Record

Sales of electric household vacuum cleaners set an industry record in 1937, amounting to 1,706,336 units, as against 1,510,953 in 1936, according to C. G. Frantz, secretary of the Vacuum Cleaner Manufacturers' Association.



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[*Continued from page 35*]

tenants and visitors. Furthermore, the addition of supply risers would have required additional switchboard panels, for which there was no room available.

Feeder voltage doubled

The idea of using a feeder potential of 460 volts, and thus being able to pass double the number of kilowatts with the same current carrying capacity, solved this problem. It was found that there was sufficient room on the fuse panels at the rear of the switchboard to accommodate fuse clips of 600-volt spacing and that the switches on the face of the board were spaced properly for 600 volts, in accordance with the National Electrical Code.

In the distribution closets on the upper floors it became necessary to bring the voltage down to 230/115 volts for distribution purposes. In Chicago the use of balance coils is contrary to the present electrical code and so two-coil air-cooled transformers were used in capacities of 75 kva. each. Each transformer was equipped with a primary and a secondary safety switch, the primary switch being fused and the secondary switch unfused. In several locations two transformers were required, operated in parallel for peak-load service, the switches making it possible to disconnect either transformer when not needed. All transformers are so equipped, because in the future it is possible that an additional transformer will be required in places where there is but one installed.

For meter protection a standardized 24-hour circuit N.E.C. fused panel was devised, with twelve 30/60-amp., eight 60/100-amp. and four 100/200-amp. sets of convertible fuse clips. For meter mountings sectional meter panels with about 24 sections were installed as standard, having each meter mounted on a 10x12-in. transite board and the meter wiring concealed within the back pocket. The sections fit into trough-shaped members in such a way that the wires can be disconnected from the meter and the section and meter lifted out by removing four screws, a great convenience in maintaining orderly metering arrangements, as the meter never needs to be removed from its section board. The new circuit fuse panels accommodate 160 branch circuits each and are in the form of four 40-circuit blocks mounted in a single inclosing case with hinged doors on front and back. These panels are set at right angles to the old cases, which, when the old panels were removed, served as junction cabinets. The bus work in the fuse panels is of a simplified drop link type, permitting of metering practically any desired group of circuits. A grounding bus, of bare wire, was installed, passing through slots in the floors.

By careful planning the overtime labor amounted to only a few hours. First, all circuits from one switchboard panel were transferred to a temporary fuse panel with 230-volt supply and the service voltage to the idle panel was changed to 460; then, as fast as the work on a transformer, meter fuse panel and meter panel could be gotten ready, its supply was reconnected to its original switch on the switchboard. Second, while the load of each old distribution panel was carried by a set of jumpers from an adjacent supply circuit, the individual meter and lighting circuits were cut over one at a time until all connections were made. This was possible, of course, on account of the nature of the tenancy and the fact that attendance is heavy only on Fridays. This procedure was repeated until all mains had been changed over. In this instance the existing feeder capacity has been doubled and the number of branch circuits increased, so that the total branch circuit capacity has been increased by nearly 100 per cent. The Furniture Mart's electricians are replacing the No. 14 B&S with No. 2 B&S branch circuit wiring, as they hang new fixtures.

From an operating standpoint the transformer losses do not present an unfavorable picture. The guaranteed efficiency of the transformers at full load is 98.5 per cent, and since the feeder voltage is now double its former value, the feeder losses are halved. These losses were in the order of 1½ per cent and are now only ¾ per cent. Therefore, about half of the transformer losses are offset thereby. The cost of the work, done as described, was approximately $40,000. Proposals for accomplishing the same result by adding switchboards, conduit and cable at 230 volts totaled twice this amount.

Analyzing Steam Plant Increment Costs

[*Continued from page 42*]

increased costs are turbine maintenance and boiler maintenance. The effects on other maintenance items, such as electric generating equipment, accessory electric equipment and miscellaneous power plant equipment, are so small as to be almost negligible.

A study of turbine and boiler maintenance data covering many years on several plants in the writer's system has led to several conclusions:

In active plants which either generate continuously or at frequent intervals it is an established practice that all turbines and boilers are subject to complete annual inspection consisting of opening up and dismantling of various parts as well as any necessary repairs or replacements. If turbines are used only at infrequent intervals for a limited number of hours per year a complete annual dismantling is not required.

Where increases in the "Peak Prepared For" require equipment to be put on the line which otherwise would not be used, it is clear that any additional maintenance costs incurred are properly chargeable to the kilowatt demand involved. These charges are: (1) Annual inspection and overhaul, and (2) replacements due to wear and tear.

Annual inspection and overhaul is a function which may be expressed as so many dollars per unit per year and is independent of the kilowatt-hour output of any unit.

For larger turbines of around, say, 40,000 kw. capacity the labor charge for annual inspection has been found to average about $3,500.

If changes in the magnitude of peak load provided for mean the difference between making an annual inspection and not making one, then this annual labor charge is properly chargeable to the increase in the kilowatt peak prepared for.

Replacement of turbine parts, due to wear and tear, is considered as a function of the number of hours that a turbine is in operation independent of any kilowatt-hour generation. In other words, this charge is treated as part of the turbine intercept and may be expressed as so many dollars per hour and added to the fuel and water intercept to give the total hourly intercept charge.

For large units this maintenance intercept has been found to average about 0.018 mill per turbine rated kilowatt per hour, or for a 40,000-kw. unit $0.72 per hour. This figure includes material as well as labor required to install it. For smaller turbines the unit charge per rated kilowatt is materially greater.

"Output in kilowatt-hours," from experience on the writer's system, does not affect turbine maintenance costs.

Boiler maintenance costs are influenced by "Plant Capacity in Kw.," "Peak Prepared For" and "Output in Kilowatt-hours."

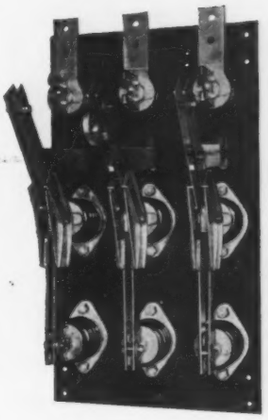
Cost studies covering a large number of boilers over a period of years, showing the relationship between boiler maintenance costs and annual equivalent kilo-

MEMCO INDOOR EQUIPMENT

Indoor Posts

For uniformity of construction and greater simplicity, Memco indoor insulator posts are standardized as to physical and electrical characteristics in accordance with the latest requirements of N.E.M.A. Available in voltage ranging from 1500 to 34500 volts. One piece, wet process porcelain units, glazed a uniform chocolate color. Substantial hardware capable of developing the rated strength of the porcelain.

Switchgear



Select by catalog number from the Memco standardized line of indoor switches such items as—

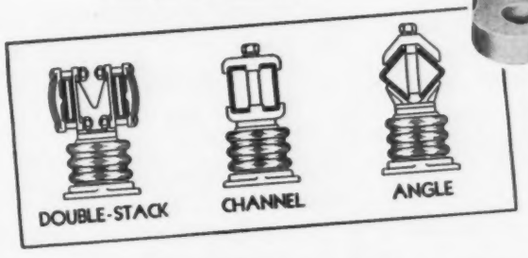
- Single throw disconnecting switches
- Double throw disconnecting switches
- Tandem transfer switches
- Double blade selector switches
- Regulator cut-out switches
- Bus tap disconnecting switches
- Fuse disconnecting switches and fuse supports

Group control mechanisms for many different applications are available and conveniently listed in Bulletin 371.

Bus Clamps

Catalogued designs include clamps for cables, flat bars, tubes, channels, angles and squares. Standard and heavy duty designs, coordinated with the insulator post strengths, are available from the catalog listings. *Bus expansion* is a factor easily disposed of with Memco "Slide-fit" clamps for flat bars, angles, channels and squares, employing the spring suspension principle shown in the accompanying cut-away illustration.

Write for Bulletin 371



Bulletin 371
BUS SUPPORTS
BUS CLAMPS
DISCONNECTING SWITCHES
FUSE DISCONNECTING SWITCHES
GROUP SWITCHES
MOUNTING ACCESSORIES

MEMCO ENGINEERING AND MANUFACTURING CO.
3750 NINTH STREET LONG ISLAND CITY, N. Y.
Sales Representatives in Principal Cities

ILSCO

Wherever you find ADEQUATE WIRING JOBS . . . you will find ILSCO Lugs. ILSCO Lugs are fully approved and inspected for your protection.

SIMPLICITY of design and quality construction characterize the ILSCO line of lugs and connectors, providing a convenient, dependable attachment for every purpose. Only the highest-grade copper is used, for maximum strength and conductivity; and stamped in clear view are wire-size and Underwriters'-Approval markings, as well as ampere rating on the Soldering Lugs, to assist you in selecting the right lug for every job.

SEND FOR NEW BULLETIN AND SAMPLE BOARD SHOWING COMPLETE LINE

ILSCO COPPER TUBE & PRODUCTS, INC.
5029 Madison Road, Cincinnati, Ohio

SOLDERLESS LUGS and CONNECTORS Simplicity Itself

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TRANSMISSION LINES
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RURAL LINES
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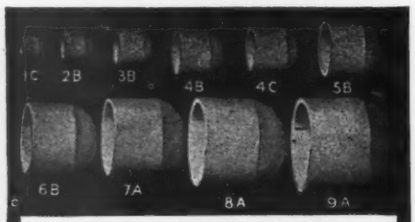
*Our twenty-five years of construction experience can be of value to you now in dependable and economical results even for the longest line extensions. Have one of our representatives call and discuss this service with you—let us submit an estimate on your next requirements.

The MILLER-BAXTER CO., Inc.
445 N. PENNSYLVANIA AVE.
INDIANAPOLIS, IND.

HIGH GRADE HARD PORCELAIN FOR Electrical Specialties
High and Low Voltages

IMPERIAL PORCELAIN WORKS
TRENTON, NEW JERSEY



STAR INSULATING BEADS
Use Lavolain ball and socket beads for insulating bare wire. Heat resistant. High di-electric and mechanical strength. Made in U. S. A. Quality beads at low cost. Quickly applied. Flexible. *Actual sizes shown above.* Ask for price list and samples.
THE STAR PORCELAIN CO.
TRENTON, N. J.

watt-hour output, have led to the following values:

For large pulverized coal-fired boilers $375 per year plus 0.028 mill per kilowatt-hour. For smaller fuel-oil-fired boilers $95 per year plus 0.089 mill per kilowatt-hour, and for stoker-fired boilers of moderate size $60 per year plus 0.199 mill per kilowatt-hour.

The annual charge or intercept may be reduced to an hourly function and used for charges of "Peak Prepared For," while the kilowatt-hour charge may be used directly as a function of "Output in Kilowatt-hours."

Tabulation of data

As an illustration of one method of tabulating increment cost data for a given plant a partial set-up is shown in the foregoing tables. This tabulation is largely self-explanatory and follows the methods outlined.

Similar tabulations are made for all steam plants in the system and sent to the central dispatching office, where they are used daily in setting up load schedules for each plant as well as for power interchange with other interconnected systems. Load allocations are made to the various plants and other sources in the order of costs, the more expensive sources being used last.

In the case of interchange with another system, it is general practice to divide the total savings accruing from the interchange equally between the two parties.

It should be understood that all unit costs are calculated on the basis of net kilowatt-hours of station send-out; that is, deductions are made for station auxiliary use of power.

Recognition of the effect of seasonal changes of vacuum due to circulating water temperatures is also given in the cost data. The year is divided into three general classifications of "winter," "summer" and "spring and fall," and corresponding rates used.

Where transmission losses are of any great magnitude, such losses are calculated and due allowance made for in the transactions involved.

•

New Westinghouse Contract

Westinghouse Electric & Manufacturing Company has been awarded a contract by the Metropolitan Water District, Los Angeles, Calif., at $23,175 for potential transformers, current transformers, lightning arresters and capacitors for use at pumping stations on the Colorado River Aqueduct.

Shreveport's New Network Trim, Guarded, Growable

[*Continued from page 39*]

extension of this service for complete coverage of the network did not seem practical and therefore a private telephone system, connecting all vaults, the feeder substation, dispatcher's office and main office, was installed. The telephone wires are carried through the network ducts, as are also the pilot wires for control of multiple street lights in the network area. Telephones are not installed in the vaults, but in each one is an outlet to which a portable instrument may be connected.

The Customer Has No Choice

[*Continued from page 50*]

Ross gets such a place, he finds that he has to load his payroll down with incompetents recommended by Senator Black or Congressman White, Governor Brown or Sheriff Blue, Mayor Green or Commissioner Gray. In short, the profits that would ordinarily go to investors—that part of the cost of service which the public ownership chaps regard as little short of legalized loot—is paid to drones important for family, partisan or other reasons to the political bosses.

But all this is just chickenfeed compared to the waste due to incompetency—to the fact that nobody is going to lose his shirt if the company does not make a profit, if it does not please its customers.

So John Taxpayer winds up paying a sizable fraction more than his service is worth, a sizable fraction more than would yield good profits to private enterprise. In return he gets the inestimable privilege of doing what his political bosses tell him. At least he has driven out the "economic royalist."

•

Air Conditioning Courses

Growing interest among undergraduates in advanced air conditioning courses is indicated by the announcement by Cornell University authorities of a new heat-transfer laboratory in the Sibley School of Mechanical Engineering. Seniors in mechanical engineering at Cornell are required to take a heating and ventilating course and this year 15 students have elected a new optional air conditioning course.

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FOR POWER LINE REHABILITATION AND EXTENSIVE CONSTRUCTION PROJECTS

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Wilson-Norris Steel Tower Line—121 miles, Tennessee
Wheeler-Guntersville Steel Tower Line—65 miles, Alabama
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Now under construction

Skagit Steel Tower Transmission Line—116 miles, Washington State

A. S. SCHULMAN ELECTRIC COMPANY
537 S. Dearborn Street
CHICAGO, ILL.
FOUNDED 1890

GREENLEE HYDRAULIC PIPE PUSHER

Makes Underground Installation Faster . . . Easier . . . Cheaper

Here is a powerful, compact tool that simplifies the underground installation of pipe for any purpose. It reduces time and labor by eliminating much trenching, etc., and it makes it unnecessary to tear up lawns and pavements. One man can operate the levers.

All that is needed is a trench long enough to accommodate the pusher with a section of pipe. As pressure is applied by pumping the handles, the power unit moves forward on a notched steel base, forcing the pipe through the earth. Considerable time is saved, since the pipe clamp is changed only every 4 to 7 feet, depending on the length of base used.

One man, standing in a comfortable position, can exert a pressure of 40,000 pounds on the pipe clamp. Pipe up to 4-inch can be pushed and eight speeds are provided.

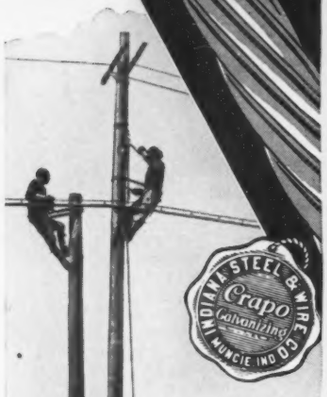
Write Now for Complete Details

GREENLEE TOOL CO., 1705 Columbia Ave., ROCKFORD, ILL.

STEEL STRAND ◆ TELEPHONE WIRE

Crapo

GALVANIZED PRODUCTS

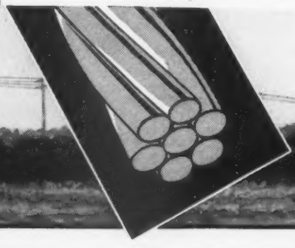


SCIENTIFICALLY MADE TO MEET SPECIFIC DEMANDS

Crapo Galvanized Steel Strand is produced from start to finish to meet the specific demands of the service for which it is intended. Each wire used in forming a particular size and grade of strand is made from the same special steel, scientifically processed in the same way, uniformly galvanized by the *Crapo* Process. The tough, heavy, pure zinc galvanized coating, tenaciously bonded to the wire by the *Crapo* method, withstands the abuse of construction, provides lasting protection.

Crapo Galvanized Strand and *Crapo* Galvanized Telephone Wire constantly are setting new records for long, economical life and low maintenance costs. Ask your Jobber, or write direct!

INDIANA STEEL & WIRE CO.
Muncie, - - Indiana



An engineering treatment of illumination and the design of lighting equipment

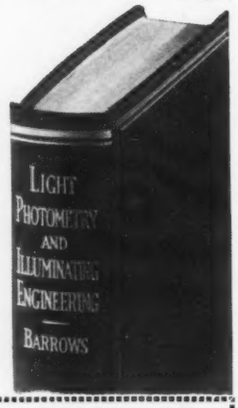
Just published

Light, Photometry and Illuminating Engineering

by WILLIAM E. BARROWS

Professor of Electrical Engineering, University of Maine

Second Edition, 445 pages, illustrated, $4.00



A text and reference treatment for the practicing engineer on illuminating engineering principles and methods. Besides covering the principles of light and vision, light mensuration, calculations, etc., this book also gives a full, clear treatment of practical methods needed by the engineer in selecting lighting equipment and designing lighting systems of various types. Covers gas and vapor lamps, needed by the engineer in selecting light-lighting, etc.

10 DAYS' EXAMINATION ON APPROVAL—SEND THIS COUPON

McGRAW-HILL BOOK CO., INC., 330 W. 42nd St., N. Y. C.

Send me Barrows—Light, Photometry and Illuminating Engineering for 10 days' examination on approval. In 10 days I will send $4.00, plus few cents postage, or return book postpaid. (We pay postage on orders accompanied by remittance.)

Name .....

Address ..... City and State .....

Position ..... Company ..... W. 2-26-38

(Books sent on approval in U. S. and Canada only.)

Curtain Rises on National Adequate Wiring Program

[*Continued from page 47*]

posed for the local operation. A certification emblem designed for this phase of the national adequate wiring program is almost the same as the national emblem except that instead of the slogan "Serves and Saves," shown in the lower half of the circle, the wording is changed to read "Certified."

Local efforts stressed

No opportunity has been overlooked in emphasizing locally the effectiveness of the adequate wiring program. A house identification poster, a certificate and identification emblem are used to register the idea with the home owner.

House posters printed in two colors and varnished for weatherproofing are provided as a means of exterior identification of an adequately wired home, certified by the local bureau.

The certificate, which is signed by the local certifying bureau and is made available by national headquarters, will be made a part of the official papers pertaining to the home to which it is awarded. It may be said the certificate is printed in two colors and is on heavy parchment paper in documentary form so that its importance will be impressed upon the home owner. Finally, as a means of permanent identification of a certified adequately wired home, a decalcomania emblem is available. The national committee recommends that it be affixed to some part of the service equipment or some other part of the permanent installation. These emblems likewise will be available from national headquarters.

•

France to Commemorate Birth of Hydro Industry

The Société Scientifique du Dauphine, which this year reaches its centenary, has decided to commemorate the occasion by taking the preliminary steps to set up a permanent memorial of the hydro-electric power industry in the French Alps in the form of a monument in memory of the two French electrical engineers—Marcel Deprez and Aristide Berges—who took a prominent part in its development.

Electrical Equipment for Battery Trucks

[*Continued from page 45*]

the tractor operator sits in a seat mounted on the battery compartment, instead of standing on a platform, the safety feature of the tractor is accomplished by the use of a spring switch which is placed beneath the seat. By this switch the main connection between the battery and the controller is established whenever the operator is seated and is cut off and the brake applied whenever he leaves his seat.

Frequently a truck is used for traction as well as transportation purposes since most trucks are provided with drawbars so that they may be attached to trailer trucks in a manner similar to tractors.

Charging equipment

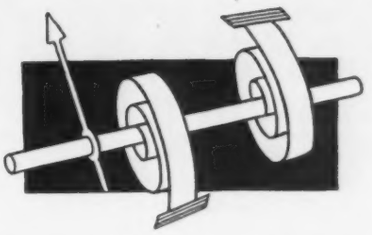
It is customary practice in the use of trucks and tractors to perform the charging at night, since practically all battery equipment provides ample capacity for a full eight or ten hours work under normal conditions. In some cases, where truck operation must be continuous throughout the 24-hour period, a second battery is provided for each truck so that one may be charging while the other is working. It is then only necessary to exchange batteries, for which purpose a roller truck is employed so that the used battery may be slid out of the compartment and the freshly charged battery inserted with but few minutes delay.

Charging is most generally performed by the use of a motor-generator the motor of which is suited to operate on any type of current that is available, while the generator is wound for direct current and designed for the particular characteristics required in charging service.

Two basic systems of battery charging are in use, known as the constant-current and the constant-voltage respectively. With the constant-current system the battery is charged at a constant ampere rate over a period of time required to bring it up to a fully charged condition. In this method of charging the voltage across the battery terminals increases as the charging progresses. The final voltage is about 2.5 volts per cell, but this may vary slightly, depending upon the par-

LINCOLN DEMAND METERS

ONLY ONE UNIT MOVES

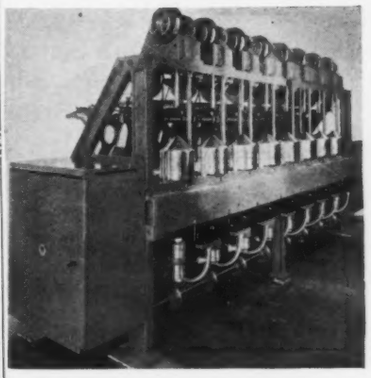


The unit shown above consists of the center shaft, two bimetallic coils, and the pointer. This comprises the moving element of the Lincoln Maximum Demand Meter. The only motion is the slow expansion of the coils and the slow turning of the shaft.

TYPE WD

SEND FOR YOUR COPY OF CATALOG TO

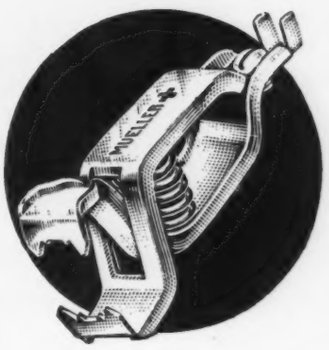
LINCOLN METER COMPANY
SPRINGFIELD, ILLINOIS



No. 2-S-8 S BB Paper Taping Machine
incorporating the following features:

Individual motor drive to each unit with push button control.
Ball bearing mounted throughout.
Automatic stops in event of tape breaking or spent cop.
Adhesive tank for each head.

EST. 1853 AIMCO INC. 1913
"American" INSULATING MACHINERY COMPANY
TRADE MARK
519 West Huntingdon St.
PHILADELPHIA PENNSYLVANIA U.S.A.



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Are Now Offered in

—8 Different Sizes
—Both Steel and Copper
—Improved Designs

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CLIP MAKERS FOR 30 YEARS
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Three types cover practically every need. Sherman Splicing Sleeves offer true economy because of the uniform high quality of their manufacture —a characteristic of all Sherman products.

TINNED SPLICING SLEEVE
(Split-Connector)

Ample tensile strength and when properly soldered wire will break before loosening in sleeve. Tests show no tendency to overheat. Use on either round or sector shaped cable. All surfaces smoothly tinned. Send for bulletin No. 20.

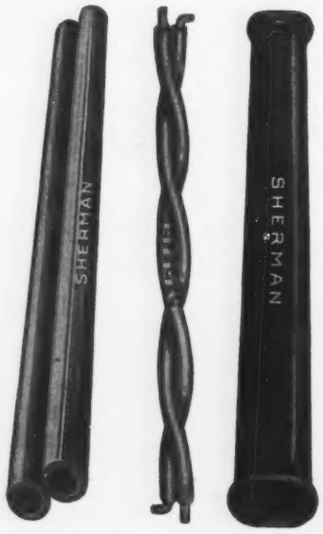


FIGURE EIGHT DOUBLE TUBE

Made from extra quality electrolytic copper of high conductivity. Seamless and free from burrs. Correctly tempered. Send for Bulletin No. 20.

OVAL SINGLE TUBE

Free from burrs and of proper temper. Carefully grooved throughout their length to prevent buckling outward when twisted. Manufactured in accordance with tentative specifications suggested by N. E. L. A. Committee. Send for Bulletin No. 20.

H. B. SHERMAN MFG. CO.
Battle Creek **Michigan**

ticular type of cell. An objection to this system of charging is the length of time required for a complete charge. This method may be used for charging the nickel-iron-alkaline battery, but it is more usual practice to employ, for this type of battery, the modified constant-voltage, or constant-potential, system, which is also most generally used for charging lead-acid batteries.

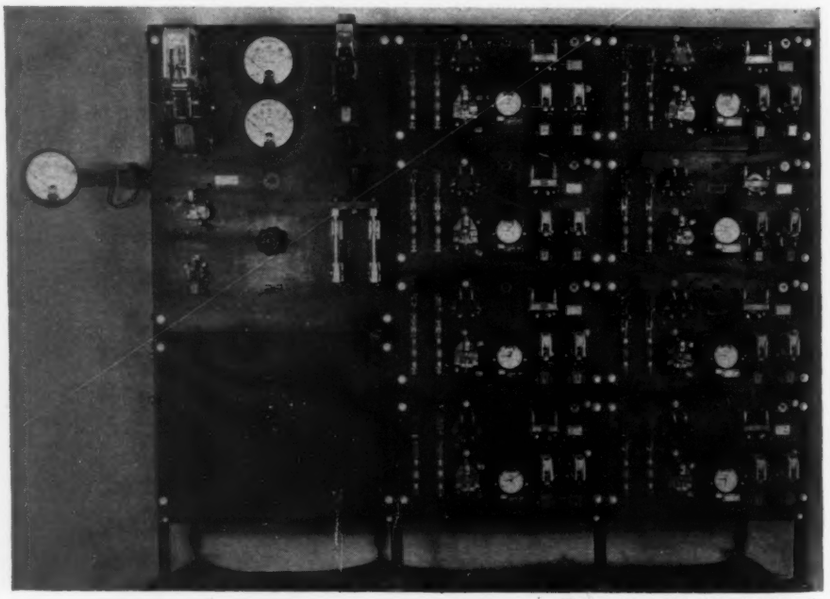
With the modified constant-voltage system the voltage of the charging current is held substantially constant, but a small amount of fixed ballast resistance, of the proper value, is connected in series with each battery on charge to produce a rising voltage characteristic at the battery terminals as the charge progresses.

Battery-charging control has been so comprehensively developed that, from the standpoint of the truck user, the charging of batteries is a most simple process which is automatically controlled at every point. Charging switchboards are built with a motor-generator control section and any required number of individual charging panels so that a single battery may be charged or as many batteries simultaneously as the capacity of the generating equipment permits. When the last battery connected to the charging board is completely charged, the motor-generator is automatically shut down. The generator panel contains the usual instruments, switches and circuit breakers for control of both the motor and the generator, together with a main bus to which each individual charging panel is connected. Each of the charging panels is provided with a main switch, which may be manually or magnetically operated, by which the panel is connected to or disconnected from the main bus. It also has an ampere-hour meter, an automatic cut-off which operates when the battery is fully charged, an automatic shut-down for stopping the motor-generator when the last battery is completed and an automatic control for regulating the charging rate as the charging progresses. A flexible cable from each charging panel is used for plugging into a receptacle on the truck so that the battery may be charged without removing it from the compartment.

•

New Survey for Huntington

Mayor Clare W. H. Bangs of Huntington, Ind., renewed his utility activities recently when he ended a City Council deadlock by voting to authorize the Works Board to contract with Burns & McDonnell of Kansas City for a survey to determine whether the city's municipal electric plant may be enlarged to compete with the Northern Indiana Power Company. The survey will cost approximately $4,500, it was estimated.



Westinghouse Electric & Mfg. Co.

Battery-charging switchboards

Panel at the left is equipped for controlling the motor-generator set, while the smaller panels at the right are for the individual control of eight charging circuits

New Pulp Mill in Florida Is Electrically Operated

Practically all of the equipment in the new kraft mill of the Container Corporation of America at Fernandina, Fla., is operated electrically, an indication that the electrical industry will share importantly in the $9,000,000 development project of this company, of which the new plant is the first unit to be completed. A 3,000-kw. steam turbine is used for generating purposes.

A substantial portion of the cost of wood pulp made from Southern pine is represented by the outlay for power. More power is required in the South than in Canadian or New England paper mills because Southern pine is a rebellious wood, taking more power for the operation of barkers and chippers.

•

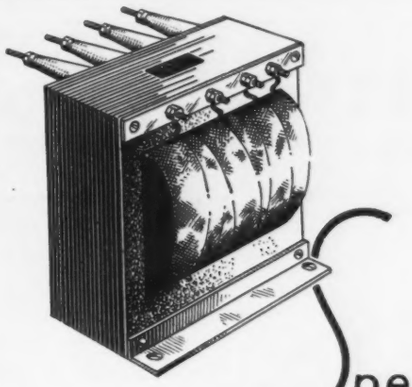
Switchgear Exhibit Tours

The General Electric modern switchgear exhibit, now in the "Southwestern" lap of its tour to acquaint people with what is new in switchgear, has been shown to 13,000 persons during the time it has been on the road. Starting May 1, 1937, at the Ambassador Hotel, New York City, the display already has been presented in 70 cities in Eastern, Midwestern and Southern states. It will return for engagements in New England after its current exhibits in Texas and Oklahoma, and possibly plans will be made for a tour of Rocky Mountain and Pacific states.

•

Eight-Year Safety Record

A safety record of more than eight years, or 1,440,223 man-hours, was recently established by the warehouse and transportation department of the Lamp Division, Westinghouse Electric & Manufacturing Company, Bloomfield, N. J., which employs 100 workers.



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Manufacturers of Lumiline Lighting

"BUILT-IN" LIGHTING COPPER LANTERNS
Wrought Iron & Bronze Fixtures
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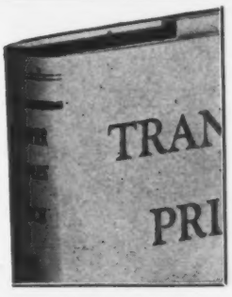
72-78 SPRING ST., NEW YORK, N. Y.
"Write for No. 38 Catalog"

Transformers
— their kinds — fundamentals — uses — operation — maintenance

For the practical man this book deals concisely and plainly with all aspects of transformer construction and use, including underlying principles, applications, connection, testing, care, and economics.



Just published

Transformer Principles and Practice

By J. B. GIBBS
Electrical Engineer, Westinghouse Elec. and Mfg. Co.

210 pages, illustrated, $2.50

FROM this book the reader will get an introduction to the fundamentals of transformer performance and construction, also descriptions of many particular types of transformers, large and small, for various purposes. Usual methods of connecting transformers are described and diagrams given, also special applications of standard transformers, including phase transformation.

Contents: 1. Introduction. 2. Single-phase and Three-phase Transformers. 3. Coils and Cores. 4. Autotransformers. 5. Transformer Cooling. 6. Temperature Indicators. 7. Transformer Polarity. 8. Usual Transformer Connections. 9. Special Applications of Standard Transformers. 10. Parallel Operation of Transformers. 11. Phase Transformation. 12. Phase Transformation by Autotransformers. 13. Ratio Adjustment. 14. Transformer Oil. 15. Maintaining Oil Quality. 16. Mechanical Forces in Transformers. 17. Constant-current-regulating Transformers. 18. Instrument Transformers. 19. Transformer Insulation and Surge Protection. 20. Transformer Testing. 21. Care and Operation of Transformers. 22. New Transformers or Old? 23. Transformer Calculations.

10 DAYS' EXAMINATION ON APPROVAL—SEND THIS COUPON
McGRAW-HILL BOOK CO., INC., 330 W. 42nd St., N. Y. C.
Send me Gibbs' Transformer Principles and Practice for 10 days' examination on approval. In 10 days I will send $2.50, plus few cents postage, or return book postpaid. (We pay postage on orders accompanied by remittance.)
Name .....
Address ..... City and State .....
Position ..... Company W.2-26-38
(Books sent on approval in U. S. and Canada only.)

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Positions Wanted (full or part-time salaried employment only), ½ the above rates, payable in advance.

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Proposals, 40 cents a line an insertion.

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Box Numbers in care of any of our New York, Chicago, or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

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1 inch $7.00
2 to 3 inches..... 6.75 per inch
4 to 7 inches..... 6.50 per inch
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An advertising inch is measured vertically on one column. 3 columns—30 inches—to a page. *Contract rates on request.* E.W.

Copy for New Advertisements Received Until Monday 10 A.M. for the Following Saturday's Issue *(published every other week)*

POSITION VACANT

ESTIMATING and Constructing engineer. Age 30 years. Experienced in high voltage transmission line, substation, power and building wiring. Wanted by an Ohio electrical contracting company of long standing. Please state complete experience, compensation desired, and enclose photograph. Strictly confidential. P-745, Electrical World, 520 No. Michigan Ave., Chicago, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000. This thoroughly organized advertising service of 28 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If you have actually earned over $2,500, send only name and address for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y. (E. W.)

POSITIONS WANTED

UTILITY CORPORATIONS: Utility real estate and franchise taxation expert realty appraiser; right-of-way acquisition; remarkably successful tax saving record in utility property taxation; salaried connection desired. PW-727, Electrical World, 330 West 42nd Street, New York City.

SUPERINTENDENT with 20 years' practical experience on overhead and underground distribution and transmission lines and substation construction and maintenance. Available February 1st. Can furnish excellent references. PW-733, Electrical World, 330 West 42nd Street, New York City.

SUPERINTENDENT—20 years' operating and engineering experience in distribution, overhead and underground, transmission, substations, customers' service. Excellent employee relations. Technical and business training. Age 42. PW-743, Electrical World, 520 No. Michigan Ave., Chicago, Ill.

BECOME AN EXPERT METERMAN

Now is the time to plan for the rapidly increasing demands of meter departments.

Central Stations everywhere must have thoroly trained men to efficiently handle meter and instrument work. Whether you have a grade school education or a degree in E.E., you can profit as a Meter Specialist.

HOME-STUDY COURSE

Up-to-Date Study Course trains you thoroly at home from mathematics of elemental electricity to full understanding of all types of meters, demand meters, instruments, relays, single and polyphase testing, repairing, calibration, etc.

Endorsed by Meter Officials Everywhere.

Low Cost—Easy Terms—Diploma Granted
Write Today for Free Booklet!

Ft. Wayne Correspondence School
Dept. 12A, Fort Wayne, Ind.

POSITIONS WANTED

ELECTRICAL GRADUATE, six years' experience in operation, maintenance and testing of transmission lines, substations and their equipment, desires new connection with good future possibilities. PW-746, Electrical World, 520 No. Michigan Ave., Chicago, Ill.

ELECTRICAL ENGINEER—College graduate, experienced portable tool design, high frequency motors; 3 years consulting work on power and heat utilization. Prefer manufacturing connection. PW-747, Electrical World, 520 No. Michigan Ave., Chicago, Ill.

MAINTENANCE and Operating Engineer—Age 37, E.E., Registered—Thirteen years practical experience in transmission, substation and distribution work. Seven years in substation maintenance. PW-748, Electrical World, 520 No. Michigan Ave., Chicago, Ill.

OFFICIAL PROPOSALS

Bids: March 2. (5)

Electrical Equipment and Circuits

SUBSTATION "E"
P.W.A. PROJECT DOCKET NO. TENN. 1107-P-D, SUB-PROJECT—CONTRACT 23
ITEM "A"—OUTDOOR SWITCHING STATION
ITEM "B"—4 KV. INDOOR SWITCHGEAR AND FEEDER REGULATORS
ITEM "C"—BENCH TYPE CONTROL BOARD
ITEM "D"—CABLES, CIRCUITS AND MISCELLANEOUS EQUIPMENT
MEMPHIS LIGHT AND WATER DIVISION, CITY OF MEMPHIS
MEMPHIS, TENNESSEE

Sealed proposals for the furnishing and installing of Electrical Equipment and Circuits for Items "A", "B", "C", or "D" or any combination thereof, for Substation "E", for the Memphis Light and Water Division, City of Memphis, Memphis, Tennessee,

P.W.A. Project Docket No. Tenn. 1107-P-D
SUB-PROJECT—CONTRACT 23
Item "A"—Outdoor Switching Station
Item "B"—4 Kv. Indoor Switchgear and Feeder Regulators
Item "C"—Bench Type Control Board
Item "D"—Cables, Circuits and Miscellaneous Equipment

will be received by the Board of Light and Water Commissioners, Memphis Light and Water Division, City of Memphis, Memphis, Tennessee, at the office of the secretary of the Memphis Light and Water Division, Goodwyn Institute Building, Memphis, Tennessee, until 2:00 P. M. on the 2nd day of March, 1938, and will be immediately publicly opened and read by the Board of Light and Water Commissioners.

Copies of the proposal, contract documents, drawings and specifications may be obtained from the office of the Memphis Light and Water Division, Goodwyn Institute Building, Memphis, Tennessee. A charge or deposit of one hundred and fifty ($150.00) dollars will be required of eligible bidders for procuring specifications, drawings and contract documents. The deposit for plans and specifications will be returned to all, except the successful bidder, on the return of plans, contract documents, and specifications in good condition within ten (10) days after bids are opened.

A copy of the plans and specifications may be examined free of charge at the office of the Memphis Light and Water Division.

Each bid must be accompanied by a censed to do business in Tennessee, in the sum of ten (10%) per cent of the amount of the bid. The bond is required as a guarantee that if the bid is accepted, a contract will be immediately entered into and the performance of it properly secured. The successful bidder will be required to execute a performance bond acceptable to the Board of Light and Water Commissioners in the amount of one hundred (100%) per cent of the contract price, and said performance bond, among other things, shall provide that the Contractor will pay for all labor and materials used by said Contractor, or any immediate or remote subcontractor under him, in said contract, etc.

Proposal form must be properly filled out and must not be detached from the specifications. No qualifying letters or statements will be considered.

All bidders must be licensed contractors as required by Chapter 70 of the Public Acts of 1931 of the General Assembly of the State of Tennessee, Section 1. Bidder's name and license number must be placed on the envelope containing these documents.

Bidders shall also designate on the envelope containing the bid the project bid upon.

WAGES: Attention is called to the fact that no less than the minimum wage rates as set up in the contract must be paid on this project.

WITHDRAWAL OF BIDS: No bidder may withdraw a bid submitted for a period of thirty days after the date set for the opening of such bids.

The estimated cost of construction of this project is $265,000.00.

The Board of Light and Water Commissioners reserves the right to reject any or all bids on any or all items, and to waive informalities therein.

Any bid received after the scheduled closing time for receipt of bids will be returned to the bidder unopened.

MEMPHIS LIGHT AND WATER DIVISION,
City of Memphis, Memphis, Tennessee
By THOS. H. ALLEN,
Chairman
W. W. MALLORY,
Vice-Chairman
I. J. LICHTERMAN,
Commissioner
Board of Light and Water Commissioners
Attest:
N. W. WADE.

Additional Proposal Advertising Continued on pages 133 and 134